FIRST REPORT

OF THE

Indian Tariff Board

REGARDING THE

GRANT OF PROTECTION

TO THE

STEEL INDUSTRY

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CHAPTER I.

Introductory.

Appointment of the Tariff Board

The Tariff Board was appointed by the Resolution of the Government of India in the Department of Commerce No 3178, dated the 10th July 1923, which reads as follows —

"On February the 16th 1923 the following resolution was adopted by the Legislative Assembly —

'That this Assembly recommends to the Governor General in Council—

(a) that he accepts in principle the proposition that the fiscal policy of the Government of India may legitimately be directed towards fostering the development of industries in India,

(b) that in the application of the above principle of protection regard must be had to the financial needs of the country and to the present dependence of the Government of India on import, export and excise duties for a large part of its revenue,

(c) that the principle should be applied with discrimination, with due regard to the well-being of the community and to the safeguards suggested in paragraph 97 of the Report of the Indian Fiscal Commission,

(d) that in order that effect may be given to these recommendations a Tariff Board should be constituted for a period not exceeding one year in the first instance, that such Tariff Board should be purely an investigating and advisory body and should consist of not more than three members one of whom should be a Government official, but with power subject to the approval of the Government of India to co-opt other members for particular inquiries"

2 The Government of India have decided to appoint a Tariff Board for a period not exceeding one year in the first instance to carry out the investigations resulting from the acceptance of

that resolution and to make recommendations thereon The following gentlemen have agreed to serve on the Board —

President

G RAINY, Esquire, C S I., C I E , I C S

Members

The Hon'ble Mr V G KALE, Professor of Economics, Fergusson College, Poona

P P GINWALA, Esquire, M L A , Bar -at-Law

Rai Bahadur S N Banerji, Assistant Secretary, Commerce Department, has been appointed Secretary to the Board

3 The Government of India will select the industries to be taken up for investigation and determine the order of the inquiry and it will be the duty of the Tariff Board, after such examination as it thinks necessary, to make recommendations regarding the protection (if any) to be extended to those industries and the nature and extent of the protection Firms or persons (other than those referred to in the next paragraph) desiring that the industries in which they are interested should be investigated by the Tariff Board should apply to the Secretary to the Government of India in the Commerce Department With their applications they should send up a full statement of the reasons why they consider that protection should be extended to the industry

4 The Board will assemble immediately at Simla As recommended by the Fiscal Commission in paragraph 107 of its Report, the Board will examine first the question of extending protection to the manufacture of steel in India In considering this question, the Board will take into account the effect of any recommendations it may make on industries dependent on the use of steel, and in particular, it will consider how its recommendations will affect the industries* referred to in paragraph 9 of the Report of the Railway Industries Committee, and whether those industries should be accorded protection Firms or persons interested in the steel industry or the industries dependent on the use of steel, who desire that their views should be considered by the Tariff Board, should address their representations to the Secretary to the Board

The headquarters of the Board will be with the Government of India, but it will visit from time to time commercial and industrial centres in India for the purpose of the investigations which it may be required to undertake While the steel industry is under

* These industries are the locomotive and wagon building industries

examination, the office of the Board will be located temporarily at Calcutta For the investigation of other industries, it may be necessary to transfer the office from time to time to other convenient centres

5 The Government of India trust that Local Governments and Administrations will afford the Board all the assistance which it may require and will comply with any request for information which may be addressed to them by it ''

It will be seen that the Board was directed to examine first the question of extending protection to the manufacture of steel in India at the same time it was instructed to take into account the effect of any recommendations it might make on the industries dependent on the use of steel, and in particular to consider how its recommendations would affect the railway wagon and locomotive building industries

Proceedings of the Board

2 The Board assembled at Simla at the beginning of July and after preliminary work proceeded to Jamshedpur early in August where evidence was taken on behalf of the Tata Iron and Steel Company Mr R Mather, Metallurgical Inspector to the Government of India, who had been deputed to assist the Board as technical adviser, joined his duties at Jamshedpur on return from leave At the beginning of September, the Board proceeded to Calcutta where its office was located during the greater part of the enquiry The works of a number of engineering firms both at Jamshedpur and in the vicinity of Calcutta were inspected by the members of the Board, and two visits were paid to Asansol in order to see the wagon building and other engineering works in that neighbourhood A large number of representations were received from firms and persons interested in the steel industry and oral evidence was also taken from numerous witnesses both official and non-official The oral evidence was taken both at Calcutta and at Bombay where the Board spent two or three weeks in the latter part of November A fuller account of our proceedings will be submitted later, but as we are anxious to lay before the Government at the earliest possible date an expression of our views on the main question referred to us, we shall not at this stage enter into further detail

Scope of the first Report on the steel industry

3 The primary question with which we have to deal is whether protection should be accorded to the manufacture of what may be called rolled steel At present there is only one firm in India which manufactures steel on a large scale, namely, the Tata Iron and Steel Company whose works are at Jamshedpur Steel castings, however, are produced by three firms, but none of them

has as yet gone beyond the initial stages of manufacture The industries directly dependent on the use of steel fall naturally into three groups —

(*a*) The engineering industry which includes a number of firms which manufacture a large variety of articles of iron and steel,

(*b*) The subsidiary industries comprising firms which have devoted themselves to the manufacture out of raw steel of some particular class of goods

(*c*) The railway wagon and locomotive building industry

We propose in this Report to concentrate our attention on the main question, which is the manufacture of rolled steel Our detailed recommendations regarding the other industries we shall postpone to a subsequent Report which we hope to submit at a very early date

Kinds of steel manufactured in India

4 Of the important kinds of steel in use only one, namely "basic open hearth" steel, can be made in India from Indian materials Indian pig iron contains a comparatively high percentage of phosphorus derived rather from the coal than from the iron ore, and this phosphorus has to be removed by the use of lime in the steel furnaces The so-called "acid" steel is made from pig iron containing only a small percentage of phosphorus which requires no special measures for its removal * In the 'basic' process the furnace is lined with burnt dolomite which is chemically a base, while in the acid process the lining is pure sand which acts chemically like an acid Acid steel can be used for practically every purpose for which basic steel is used, and also for purposes for which under existing regulations basic steel is inadmissible, *e g*, the boilers, axles and tires of locomotives The use of acid steel is still compulsory for the axles and tires of railway wagons in India, but there is an alternative British Standard specification which permits the use of basic steel The basic process is not used for the production of the high grade and special steels (sometimes alloyed with other metals) required for cutting tools and all articles in which great hardness or toughness is required, but the manufacture of these steels is not likely to be attempted in India for many years to come Our enquiry therefore is confined to basic open hearth steel and such steels as compete with it for ordinary purposes

Description of processes of iron and steel manufacture

5 The processes of iron and steel manufacture are somewhat technical, and it may be useful if at the outset some general description of those employed in India is given The important

* The "basic" Bessemer process cannot be used in India for the converse reason that Indian pig iron does not contain enough phosphorus

raw materials required for the making of steel are iron ore, a mineral which contains iron, coal, which is used as a fuel for producing high temperatures and as an agent for separating the iron from the oxygen with which it is combined in the ore, and limestone or dolomite, which are used as fluxes for carrying away in the form of a fusible slag the impurities which occur in the ore and in the coal

Two main stages of manufacture—(1) pig iron and (2) steel

6 There are two main stages in the production of steel from iron ore In the first, the ore is converted into pig iron, a crude form of iron which contains impurities to the extent of about 6 or 7 per cent This operation is performed in 'blast furnaces' In the second stage the impurities of the pig iron are removed to the necessary extent in 'open hearth furnaces' The product is then steel Both these operations require very high temperatures—about 1600° C —in the furnaces and both yield molten products

Manufacture of coke and its bye products

7 Very few kinds of coal are suitable for use in the blast furnace direct, and the first step in the manufacture of pig iron is therefore the conversion of coal into coke The coke is made by heating crushed coal of a suitable quality in "coke ovens", which are built mainly of silica bricks and fire bricks The ovens are heated to a high temperature by burning (in flues round the ovens) part of the gas which is given off from the coal The direct products of the operation are coke and a fuel gas which is similar to ordinary town gas The gas contains tar, which is separated for use elsewhere in the works or for sale; and also ammonia which is separated by means of sulphuric acid, forming sulphate of ammonia which is a useful fertilizer Since only a part of the gas which comes from coal is needed for heating the ovens, the remainder is "surplus" gas which can be used in heating furnaces in other parts of the works The tar and the sulphate of ammonia are "bye-products", the value of which reduces the net cost of the coke Most of the sulphate of ammonia produced in India is exported to Java and Mauritius for use as a fertilizer in the sugar plantations in those islands, and it is regrettable that more use is not made in India itself of a very important aid to agriculture

The blast furnaces

8 The coke thus produced is charged, together with iron ore and flux (at Jamshedpur, dolomite), into the blast furnace which is essentially a high shaft built of special bricks and of different internal diameters at different heights A blast of hot air is blown into the furnace to burn the coke This produces the necessary temperature in the furnace and provides the conditions in which the iron is

separated from the ore and in which the impurities in the ore and the coke join with the flux to form a slag. This slag is lighter than the molten iron and separates itself by floating on the top of the iron. The products are molten pig iron, molten slag (at Jamshedpur about half a ton of slag for each ton of pig iron) and 'blast furnace gas' which is combustible. The gas can be used for heating the blast of air, for heating certain furnaces and (by burning under boilers or in gas engines) for the production of power. Between one-third and one-half of the gas is required for heating the blast and for the engines producing the blast. The remainder is surplus and can be used for other furnaces and for power. The slag is of little value.

9. The open hearth furnace is built of fire-brick, silica-brick and magnesite brick and has a concave oval hearth of burnt dolomite or magnesite. The furnace is heated by burning gas (usually generated from coal in a special apparatus called a gas producer). The pig iron and such steel scrap as is available are put in the furnace and the molten mixture is treated with a small proportion of iron ore and with lime. The ore and lime remove almost the whole of the impurities from the pig iron (forming a slag which is practically valueless) and the process is adjusted to yield steel having a composition which will produce the necessary mechanical properties in the finished article. The steel leaves the furnace in a molten condition.

The open hearth steel furnaces.

10. The steel having thus been made it only remains to give it the final form required by the user. For this purpose it is cast into "ingots" which are blocks of (at Jamshedpur) about 5 feet high and 20 to 22 inches square weighing about 3 tons each. The ingots are then brought to the necessary shape by rolling in 'rolling mills" in which the hot steel is passed between suitably grooved rolls rotated by sufficiently powerful engines or motors to squeeze the steel to the desired shape of cross-section. The ingot passes first through the 'blooming mill' which reduces it to a 'bloom" having a section of 6 to 9 inches square or to a "billet' usually about 4 inches square the length being in each case proportionately increased. The bloom then passes to the "rail and structural mill" where it is given the final shape of a rail or of a structural section such as a beam. The billet which is intended for smaller sections is transferred to a "bar mill' where it is given the final shape of the bar required.

The rolling mills.

11. In the process of converting pig iron into finished steel there is a certain wastage of the raw material. About five per cent is lost in the steel furnaces and in the rolling mills another five per cent disappears

Quantities of materials used.

owing to the formation of scale on the surface of the hot metal But in addition the rolling process necessarily involves the creation of a considerable amount of scrap, *i e*, portions of the ingots, blooms, billets, etc, removed in the process of rolling Of each ton of steel ingots only about 15 cwts appear as finished steel Out of the balance of 5 cwts nearly 1 cwt is finally lost or can be used only as material for the blast furnaces The remainder* (more than 4 cwts) is scrap which is unusable as steel, but it can still be used as the raw material for steel, and it goes back into the steel furnace along with the pig iron as part of the metallic charge It is, in fact, pig iron from which the impurities have been removed and it only requires to be remelted in order to become available The net consumption of pig iron is therefore about 11 tons for every 10 tons of finished steel † For each ton of pig iron produced, the approximate consumption of iron ore is $1\frac{3}{4}$ tons and of coking coal $1\frac{3}{4}$ tons Similarly for each ton of finished steel, nearly two tons of iron ore and about $1\frac{5}{6}$ tons of coking coal are used

The Duplex process

12 The above description applies to the older and simpler portion (West plant) of the Jamshedpur works In the newer portion (Greater Extensions or East plant) there are certain differences in the steel making and rolling The pig iron is converted into steel by a "Duplex" process, in which the molten iron is first poured into a "Bessemer converter"—a large vessel lined with refractory material—in which air under pressure is blown through the metal When part of the impurities of the pig iron have been removed by the air, the still molten metal is transferred to a large tilting open hearth furnace in which the remainder of the impurities are removed and the quality of the steel is finally adjusted This furnace works on the same principles as the open hearth furnace already described but the size and mechanical arrangements are different

The new mills

13 The steel ingots from the new plant are rolled in a new blooming mill Nearly all of them become blooms but some are rolled (in this mill) into 'slabs' which are thick flat pieces (generally about half as wide as they are long) which are suitable for rolling into plates in a special plate mill Some ingots will be specially cast into a form resembling a large slab for direct rolling in the plate mill Some

* In the cost accounts the scrap recovered is valued at a uniform rate per ton The department in which it is produced is credited with the value at this rate, and a corresponding debit is made for scrap used in the Open Hearth Department

† This ratio holds good only if two conditions are fulfilled—

(1) That all the scrap produced in the works goes back into the steel furnaces,

(2) That no scrap is used which is brought in from outside the works

of the blooms from the new blooming mill will be transferred to a new rail mill to be rolled into rails and structural sections The remainder of the blooms will go to a " sheet-bar and billet mill " which consists of several sets of rolls placed one immediately behind another so that the bloom passes through them successively, travelling always in one direction Such mills are " continuous " In this mill the bloom is rolled either into small billets or into ' sheet-bars ", which are long, thin, flat bars (for example, 20 ft long, 8 inches wide and $\frac{1}{4}$ inch thick) which are cut into short lengths for rolling in a " sheet mill " into thin sheets such as are used for galvanised sheets and tin plate The small billets from the sheet-bar and billet mill go to a continuous ' merchant mill ', or bar mill, which will roll them into bars of the ordinary small sections suitable for the merchant trade This will also produce ' wire rods', *i e* , round rods less than $\frac{1}{4}$ inch diameter suitable for being drawn into steel wire

The Tata Iron and Steel Company

14 The works of the Tata Iron and Steel Company are situated at Jamshedpur in the Singhbhum district about 150 miles to the west of Calcutta The Company was formed in 1907 and the construction of the works began in 1908 Pig iron was first produced in December 1911 and steel in 1913, and by 1916-17 the old plant, under the stimulus of the war demand, was in full production In that year a very large scheme of extensions (known as the Greater Extensions) was mooted and is now (February 1924) on the eve of completion It was originally hoped to complete the extension scheme in 1920 or 1921 but construction was very greatly delayed, first because, during the period of hostilities, priority certificates had to be obtained from Government before the manufacture of the new plant could begin and secondly because when the war was over and the post-war boom in iron and steel began there were inordinate delays in the delivery of the machinery already ordered By 1921-22, the only part of the new plant directly contributing to production was the third blast furnace During 1922-23 and 1923-24 other parts of the plant have begun to operate and the remainder will do so in 1924-25

Actual and future production of the Tata Iron and Steel Company

15 The finished steel products manufactured by the Company in the old plant comprise rails and heavy structurals (beams, angles, channels, etc) in the rail mill and bars light structurals, light rails and fish plates in the bar mill The additional products which the Company will be equipped to manufacture in the new plant are plates sheets—black and galvanised—sheet-bars and steel sleepers The following table compares the production of

the years 1916-17 and 1921-22 with the production expected when the new plant is in full operation —

	Production in 1916-17	Production in 1921-22	Production expected when new plant is in full operation
	Tons	Tons	Tons
Coke	250,542	359,923	850,000
Pig iron produced	137,197	270,270	610,000
Pig iron sold	39,541	104,402	10,000
Steel ingots	139,143	182,107	570,000
Finished steel—			
Heavy rails	54,021	77,880	235,000
Heavy structurals	11,838	18,193	
Light rails and fish plates	5,379	6,560	62,000
Bars and light structural	24,189	23,018	
Plates			48,000
Sheets			36,000
Sheet-bars			35,000
Sleepers			3,000
Blooms and billets for sale			3,000
Total finished steel	98,726	125,871	422,000

The production of pig iron increased by more than 80 per cent between 1916-17 and 1921-22, mainly owing to the construction of the third blast furnace. Steel production increased, but only by about 27 per cent., owing to the erection between 1916-17 and 1921-22 of three new open hearth steel* furnaces. The output expected when the new plant is in full operation is more than twice the 1921-22 output of pig iron and more than three times the output of finished steel.

* These are additions to the old plant and not part of the extension scheme.

CHAPTER II.

The Steel Industry and the conditions laid down by the Fiscal Commission.

compete with them on equal terms, and therefore the natural advantages possessed by an Indian industry should be analysed carefully, in order to ensure as far as possible that no industry is protected which will become a permanent burden on the community

(2) The industry must be one which without the help of protection either is not likely to develop at all or is not likely to develop so rapidly as is desirable in the interests of the country This is an obvious corollary from the principles which have led us to recommend protection The main object of protection is either to develop industries which otherwise would not be developed or to develop them with greater rapidity

(3) The industry must be one which will eventually be able to face world competition without protection In forming an estimate of the probabilities of this condition being fulfilled the natural advantages referred to in condition (1) will of course be considered carefully The importance of this condition is obvious The protection we contemplate is a temporary protection to be given to industries which will eventually be able to stand alone "

India's resources in iron ore

18 Our enquiries have satisfied us that India possesses great natural advantages for the production of steel and iron and that the first condition laid down by the Fiscal Commission is therefore fulfilled Of the raw materials required the three most important are iron ore, coking coal and limestone (or dolomite) for fluxing purposes Large deposits of iron ore exist in many parts of India, particularly in the Central Provinces, but at present by far the most important are those which lie in the so-called 'iron belt' extending over the district of Singbhum and the adjoining Feudatory States of Orissa The belt contains enormous quantities of extremely rich iron ore in which the proportion of metallic iron frequently rises above 60 per cent This ore can be mined cheaply and landed at the Iron and Steel works at a cost of between Rs 3 and Rs 4 per ton The Director of Geological Survey has supplied us with extracts from a report* by Dr Fox, an officer of the Department, on the mineral resources of India for a domestic steel industry, in which the iron ore deposits of the country are described Dr Fox mentions two estimates of the quantity of high quality iron ore available in the so-called 'iron belt', both of them in the neighbourhood of 3,000 million tons Other authorities have taken

* See Annexure

lower figures and, until further exploration has been made, no exact estimate is possible, but there is general agreement that the quantity is very large In other parts of the world equally rich ore is to be found, but it cannot be landed at the iron works at anything like the same price Conversely, equally cheap ore exists in some countries but of nothing like the same quality The advantage India possesses in the shape of iron ore is therefore very great

Coking coal

19 India's resources in coking coal, so far as they have been ascertained, are not on the same scale as her supplies of iron ore In quality Indian coal is inferior to the coal available in the great steel making countries of the West, and the high percentage of ash content renders it necessary to use more coke in the blast furnace Nevertheless, since even now Indian coal is relatively cheap, the total cost of coke per ton of pig iron is not excessive The question of quantity is more serious It has been discussed both by Dr Fox in the report already referred to, and by Dr Pascoe, the Director of the Geological Survey, in his forwarding letter Both officers explain the great difficulty there is at present in forming any definite estimate of the total quantities of coking coal suitable for metallurgical purposes which are available in India, and until the experts have investigated the matter further, it would be useless for us to enter on any detailed discussion The last sentence of Dr Pascoe's letter, however, is important "I think it is safe , he writes, " to conclude that, assuming 3 tons of coking coal to be necessary to produce 2½ tons of coke, there is enough coking coal in India to supply the iron and steel industry with 4 million tons of metallurgical coke per annum for the next 150 years at least "

Conclusions regarding the supply of coking coal

20 The general conclusions which the evidence suggests might perhaps be stated as follows —

(1) There are sufficient supplies of coking coal available to meet the needs of a steel industry capable of providing for India's own requirements and a certain surplus for export for over a century

(2) The question whether coking coal exists in sufficient quantities to justify the establishment of a large export trade in steel cannot be settled until further surveys and explorations have been made

(3) The information at present available suggests the desirability of conserving India's resources of metallurgical coking coal It would clearly be unfortunate if large quantities of very rich ore could not be utilized in the country for want of a suitable fuel

The last point is clearly important It is conceivable that new discoveries may render it possible to utilize in the manufacture of iron coal which is at present classed as non-coking It is possible also that fresh discoveries of coal may be made in regions where iron ore is also present Thus, for example, in the course of the surveys for new railway lines crossing the belt of feudatory states which lie between Chota Nagpur and the Central Provinces, the existence of coking coal has been proved in at least two coalfields (Jaghakhand and Jhilmili) It is unsafe of course to place much reliance upon mere possibilities, and the need for a thorough investigation of the question by the Geological Survey is obvious in order to remove the uncertainty which exists But the doubt relates only to the comparatively distant future, unless the growth of the iron and steel industry in India exceeds all expectations The Tata Iron and Steel Company informed us that they believed they had 400 million tons of coking coal in their mines in the Jharia and Raniganj fields, and the United Steel Corporation of Asia have also seemed ample supplies of coking coal

Vicinity of the coalfields and the iron ore deposits

21 The present pre-eminence of the Singhbhum and Orissa iron belt is due not only to the richness and abundance of the ore deposits but also to the fact that they are situated at a distance of about 200 miles more or less from the coalfields This is important because the freight on raw materials is a heavy item in the cost of production The Tata Iron and Steel Company at present brings its iron ore from a distance of about 50 miles and its coal from an average distance of a little over 100 miles, the freights paid being about 7½ annas and Rs 1-5-6 per ton respectively It would be easy to quote instances, both from Europe and America, where the manufacturer obtains his supplies of raw materials from a much shorter distance, but on the continent of Europe either the coal or the ore has often to be brought from a distance of 200 miles or more, and in America the distances are much longer The greatest centre of steel manufacture in the world is the western district of Pennsylvania, which brings its iron ore from the western shores of Lake Superior, more than a thousand miles distant, the journey involving a double transference from rail to water carriage and *vice versa*, and its coal by rail from a distance of about 60 miles It will be seen, therefore, that in this respect India possesses a natural advantage over many countries

Limestone

22 In respect of fluxing materials India does not possess the same superiority as in ore, but economically is at no disadvantage Limestone of the best quality is to be found in India, but at such distances from the

iron ore and coal as to preclude its use for metallurgical purposes There are however, ample supplies of limestone and dolomite within a reasonable distance of the other raw materials These supplies though not equal in quality to those available in other countries are nevertheless sufficient for the purpose Larger quantities have to be used but, as the materials are cheaper, the cost of flux is not on the whole higher than it is elsewhere

Other raw materials

23 Most of the other materials required by the industry exist in India, and the few exceptions are only required in small quantities We need only mention —

(*a*) manganese, of which ample supplies exist in the Central Provinces, and

(*b*) refractory materials

Amongst the latter fireclay exists in many parts of India and the manufacture of fire-bricks is carried on extensively The manufacture of silica bricks was also established during the war at Kumardhubi raw materials of excellent quality being obtained from the south of the Monghyr district The silica bricks produced in India are probably not yet equal in quality to those produced in Europe and America but the quality is improving and we see no reason why eventually full success should not be attained

Low cost of manufacturing pig iron in India

24 Of the natural advantages which India possesses for the manufacture of iron and steel, no better proof can perhaps be given than the fact that she already produces pig iron more cheaply than any other country in the world and a considerable export trade with Japan and the West coast of America has come into existence The low cost of pig iron means that the Indian steel manufacturer starts with a distinct advantage over manufacturers elsewhere but at present this advantage is lost owing to the higher cost of the subsequent processes It has already been proved by the Tata Iron and Steel Company that steel of a thoroughly sound quality can be manufactured in India and the steel furnaces during the war attained a rate of output not inferior to that of western countries It has not hitherto been found possible, however, in India to combine high output with satisfactory quality During the war quality had to be sacrificed to quantity and since the war quantity to quality The problem remaining to be solved is how to increase the rate of production without sacrifice of quality, and as soon as that has been done India's natural advantages will have full play

Indian labour in the steel industry

25 The question of the natural advantages and disadvantages of an industry has other aspects besides that of the raw materials, and the Fiscal Commission referred specially to labour and the market for the goods produced In respect of labour India suffers under a disadvantage inevitable in any country which is mainly agricultural, and where industrial experience and training has still to be acquired This renders it necessary at present to import skilled supervision from Europe or America for the more difficult processes involved in the manufacture of iron and steel This is a temporary difficulty which will eventually disappear As regards unskilled and semi-skilled labour wages in India are relatively low but it is doubtful whether in this matter India has any advantage Low-paid labour is not necessarily cheap and far more men are employed in iron and steel works in India than would be considered necessary in western countries In this matter also time should work an improvement

The Indian market for steel

26 The market for steel in India is of course not comparable to that which exists in European countries or in America, but large quantities of steel are imported annually Up to the outbreak of the war the market was steadily growing and in due course the upward movement will no doubt be resumed The total consumption of iron and steel in India may be put in the neighbourhood of a million and half tons and of steel only at about a million tons These figures however include a considerable amount of machinery hardware motor cars etc which are not likely to be produced in India for many years to come Nevertheless the market is already large and with the expansion of demand which may be expected in the next ten or fifteen years provided there is an adequate extension of transport facilities there would be room for two or three steel works each with an output comparable to that of the works at Jamshedpur

The Fiscal Commission's second condition Necessity of protection for development of the steel industry

27 The second condition laid down by the Fiscal Commission is in some respects the most important of all If the other conditions are satisfied the only admissible inference is that protection is legitimate if necessary but the question of necessity is still open It has been the main object of our enquiry to ascertain whether the steel industry can be established in India without protection and the greater part of this report is devoted to setting forth the facts on which the answer to the question must be founded It is not necessary at this stage that we should do more than state the conclusion at which we have arrived At the present level of prices and with the present cost of production the

manufacture of steel at Jamshedpur is unprofitable and involves a heavy loss There is every hope that, in the course of three or four years, production costs will be substantially reduced, owing to the adoption of a new process of manufacture and the provision of an up-to-date and efficient plant But there must be an extremely difficult transition period during which assistance is specially necessary It is not a question of inability to pay dividends on an excessive capital but of inability to manufacture and sell steel except at an actual loss If the efforts of the firm which has been the pioneer of steel manufacture in India were to end in disastrous failure, it would be idle to hope that fresh capital would be forthcoming, and all prospect of further development for the next ten or fifteen years would be at an end We had it in evidence from Mr Fairhurst that the Indian Iron and Steel Company would not under present conditions consider the question of embarking on the manufacture of steel unless protection were given, and Mr Tarlton, giving evidence on behalf of the United Steel Corporation of Asia, stated that without protection it would be impossible to raise the capital required for a fresh enterprise Our deliberate opinion is that, without the help of protection, the steel industry is not likely to develop at all

The Fiscal Commission's third condition Eventual ability of the steel industry to exist without protection

28 The third question we have to answer is whether the steel industry is one which will eventually be able to face world competition without protection We have no hesitation in answering it in the affirmative As we have pointed out, India can already produce pig iron more cheaply than other countries The process of steel manufacture is admittedly much more difficult, and years must elapse before Indian labour acquires the necessary skill and experience But India's natural advantages are so great that we believe it will not be long before the initial difficulties are overcome, and steel is produced at a cost low enough to enable it to face outside competition in India without protection

Importance of the steel industry on national grounds

29 Before quitting this branch of the subject we must advert briefly to one aspect which is of paramount importance In paragraph 106 of their Report the Fiscal Commission discussed the treatment of industries essential for national defence or of special military value, and affirmed without hesitation the principle that "any industry which is essential for national defence and for which the conditions in India are not unfavourable should, if necessary, be adequately protected irrespective of the general conditions which we have laid down for the protection of industries" In the next paragraph they observed "In the first place there is the steel and iron industry

There can be no question of its importance for purposes of national defence, and there appear to be no natural obstacles to its development in India " On the basis of these statements the case for protecting steel appears to us to be overwhelmingly strong The extreme importance on national grounds of the existence of steel manufacture in India was demonstrated over and over again during the war, and it is unnecessary to recapitulate facts which are common knowledge If, in accordance with the principles laid down by the Fiscal Commission, the protection of steel is not held to be justified, we are at a loss to imagine what industry could possibly comply with them It is impossible to conceive a stronger case

CHAPTER III.

General Principles underlying the Scheme of Protection.

General principles of the protective scheme

30 In the last Chapter we have described the natural advantages which India possesses for the manufacture of iron and steel,—advantages great enough to warrant the belief that the Indian steel industry will eventually be able to face world competition without protection We have still to give our reasons for holding that without protection the industry may cease to exist and will certainly not develop for many years But before we enter on this branch of the subject, it is desirable that we should state briefly certain general principles which have guided us in our consideration of the subject, and which underly all our recommendations They are as follows —

(1) The answer to the question whether protection is necessary depends in the main on the difference between two prices

(*a*) the price at which steel is likely to be imported into India from abroad, and

(*b*) the price at which the Indian manufacturer can sell at a reasonable profit

(2) If protection is found to be necessary, and the advantages to be derived from it are held to outweigh any objections which may exist then the measures taken must be adequate to secure their purpose

(3) The scheme of protection should be so adjusted as to interfere as little as possible with those kinds of steel which are not manufactured in India at present and are not likely to be manufactured in the near future

Difference between prices

31 The first point referred to in the last paragraph need not detain us long It is, indeed, obvious that the need for protection exists in so far as the Indian manufacturer, selling his steel in competition with imported steel, fails to realize a fair profit or incurs an actual loss We have mentioned the point specially here both because, in our opinion, the

difference between the two prices is the natural measure of the amount of protection required and because it affects one of our subsidiary proposals referred to in this Chapter (see paragraph 36, below)

Protective measures must be adequate to secure their purpose

32 We desire to lay great stress on the second point The immediate object of the scheme of protection is the preservation of the industry as it exists at present Its remoter, but equally important, object is to attract capital to the industry and promote the development of India's natural resources From both points of view the protection given must be adequate The immediate needs of the industry must determine the amount of protection to be accorded at the outset, but the future of the industry must also be considered The object in view will not be attained if steel manufacture in India continues to be the monopoly of a single firm, for, unless there is internal competition within the tariff wall, the stimulus to economical production disappears It is far from an extravagant ambition that within fifteen or twenty years India should be able to provide the whole of her domestic requirements of most kinds of steel, and should be able to produce at as low a cost as other countries It is this result which would finally justify the demand for protection, but it will not be achieved unless the capitalist judges that the price he is likely to obtain gives him a reasonable profit, and unless he believes that protection for the steel industry has become the recognized policy to which Government will adhere It may not be possible under existing conditions to retain any one rate of protection for a lengthy period Industrial conditions have been profoundly disturbed by the war, and all forecasts of the course of world prices are likely to be falsified Long views are impossible, and tariff duties which give reasonable protection when first imposed may, in the course of a year or two, prove inadequate or excessive Precisely for this reason it is important that the policy should be clearly laid down Unless protection is adopted as the result of a deliberate decision of Government and the Legislature to encourage the development of the steel industry in India, it will not be easy to enlist fresh capital in the business The capitalist must look for an assurance that protection will be continued to the extent necessary for the full period which must elapse before anticipations can be tested by results From the date when a new firm decided to establish steel works five years would probably elapse before steel was actually manufactured and another five years before the success or failure of the venture could fairly be estimated In these circumstances continuity of policy is essential and it seems to us desirable that the policy should be clearly declared in the preamble to any legislation which is undertaken

33 The uncertainty of the future course of world prices makes it necessary to buttress the scheme in another way We have said that the natural measure of the protection required is the difference between the price at which foreign steel enters India and the price which gives the Indian manufacturer a reasonable profit But that difference may vary either because of changes in the cost of production or, much more frequently, because of fluctuations in the import price If the rate of protection requires revision because of changes in production costs, that is clearly a matter which should be settled by the Legislature after a full enquiry If again, circumstances have changed owing to a rise in the price of imported steel, no authority other than the Legislature should have power to reduce the tariff duties and in this case also a full enquiry would be desirable But when a marked fall occurs in the price of imported steel an immediate remedy may be necessary, and we think the executive Government should have power to apply that remedy at once, for, if the intervention of the Legislature were necessary, much mischief might be done before action was taken If the measures adopted are to be adequate for their purpose this contingency must be provided for

Necessity that Government should have power to make the protection given effective

34 The danger of foreign steel entering India at abnormally low prices is, we believe, a real one Since 1921 the cheapest imported steel has come from Belgium, though, in 1922 at any rate, part of it may have originated in Germany During the last few months there has been a rapid increase in the French production, and it is quite possible that France may become a more formidable competitor in the world's steel markets than she has hitherto been The results of the resumption of steel production in Germany on a large scale, if and when a settlement of the reparations problem is attained might of course be serious, and the menace of the release of the Ruhr stocks has not yet been finally dispelled Under these conditions wide and sudden fluctuations in the price of steel are not improbable

Danger of invasion of the Indian market by cheap steel from abroad

35 We have considered the legislation adopted in other countries to guard against similar dangers, but we have not found it possible to frame our proposals on the model of any of them In such measures the executive Government is usually empowered to take action when the fall in prices is due to some particular cause, *e g*, the depreciation of the exchange, the grant of bounties or the low cost of production in the country of origin But if the end in view is to secure to the domestic manufacturer a reasonable price the causes which have enabled

Necessity for complete powers to impose additional duties

the foreign manufacturer to send his steel into India at lower prices are really irrelevant If economic conditions in the world generally were more stable, it might be possible to dispense with additional safeguards or to limit them to particular dangers But, things being as they are, we believe that special powers are necessary, and that they should be complete and not hedged about with restrictions

Measures proposed

36 The power which we propose should be conferred on the executive Government in any legislation undertaken to give effect to our proposals may be defined as follows

If the Governor General in Council is satisfied, after such enquiry as he considers necessary, that steel is entering India from abroad at such prices as are likely to render the protection given by this Act ineffective, he may impose such additional duties as in his judgment are required

It will be seen that the only point to be determined by enquiry would be the prices at which steel was actually entering India, and these would be compared with the assumed prices taken as the basis of the protective duties determined by the Act itself (*vide* paragraphs 45 and 97 below) Arrangements would be necessary at the Customs Houses in the principal ports to record from the invoices the actual prices at which protected goods were being imported, and if this were done it should be possible to complete the necessary enquiries promptly It would then rest with the Government of India to decide whether a case for the exercise of their special powers had been made out A comparatively small decline in the price, or a fall likely to be of very short duration, might not be a sufficient ground for taking action But the power to act when necessary should be unfettered

Supplementary provisions

37 We do not propose at this stage to develop the details of the scheme further, but two points may be mentioned—

(1) The actual enquiries might, we think, be made at the ports by the Collectors of Customs who would report to the Government of India through the Board of Inland Revenue

(2) The power given should be capable of exercise in the case of imports from all countries, or in the case of imports from a particular country or countries

Main object to be attained

38 Legislation of the kind proposed is often described as "anti-dumping", but we have deliberately refrained from making use of that word Whatever the precise meaning of "dumping"

may be, it always carries with it a suggestion that the "dumpers" are guilty of some degree of moral obliquity, and may therefore justly be penalized We prefer to rest our case on other grounds Whatever the reasons for abnormally low prices may be—whether bounties in the country of origin, specially reduced freights, a depreciation in the exchange of a particular country, a rise in the value of the rupee as compared with other currencies, or the sale of steel at unremunerative prices—the effect on the Indian market is precisely the same It is this effect which has to be dealt with, if the protection given is to be effective

Avoidance of interference with steel not produced in India

39 On the third point mentioned in paragraph 30 a few words will suffice The policy laid down for our guidance is that of discriminating protection which restricts the burden on the consumer to the minimum necessary to attain its object It follows that those kinds of steel which are not produced in India at present, or are not likely to be produced in the near future, should, as far as possible, be left untouched We mention the point here because we desire to make it plain that this consideration has been present to our minds throughout our enquiry To put it very briefly, there is no need for protection unless there is something to protect

CHAPTER IV.

Prices of Imported Steel.

Course of steel prices before and after the war

10 It is necessary for our purpose that we should describe briefly the course of steel prices during the last few years In the last three years before the war the f o b price of imported rails was about £6 a ton, structural sections and plates a few shillings higher, galvanised sheets about £12 a ton, and the average f o b price of continental mild steel bars about £5-10 a ton The landed prices in India may be taken at about £1 a ton above these figures During the war the importation of steel from abroad was extraordinarily difficult, and such steel as was available naturally commanded a very high price War prices, however, have no special significance for our purposes and need not be discussed After the cessation of hostilities steel prices fell heavily in the earlier part of 1919, but later in the year a recovery began which became more rapid as it proceeded, and during 1920 unheard-of levels were attained The Great Indian Peninsula Railway, for example, paid £17-10 a ton (f o b) for imported rails in 1920-21, and the Bombay, Baroda and Central India Railway from Rs 340 to 350 a ton (c i f) for imported structural shapes Continental mild steel bars again were quoted as high as £29 a ton c i f Bombay in November 1920, and the market quotations in the United Kingdom rose to £24 a ton for beams and common plates and to over £50 a ton for galvanised sheets The boom was not of long duration, however, and the fall of prices in 1921 was as rapid as the rise had been Throughout 1922 and 1923 prices have continued at a low level, the only changes of importance being—

(*a*) A sharp rally in prices for a few months during the spring of 1923 after the occupation of the Ruhr, followed by a gradual decline though not quite to low-water mark

(*b*) An appreciable increase in British market quotations for steel apparently due to prospects of better trade at the end of 1923

Lowest level of prices

41 The low level which prices have touched are indicated by the following quotations —

	c i f price per ton Rs	
Rails	133 8	Imported by the Bengal Nagpur Railway in 1923, the order having been apparently placed in 1922 The f o b price was £7-10 0 a ton

	c i f price per ton Rs	
Angles Channels	133 132	Imported by the Bombay, Baroda and Central India Railway in 1923
British beams	139	Imported by Messrs Richardson and Cruddas in 1922
Continental mild steel bars	108	Imported by Messrs Trivedi and Co in November 1922
Galvanised sheets	280	The average British market quotation in 1922 was £17-5-0 a ton The price given is the equivalent c i f price after allowing for freight, insurance, etc

Comparison with pre-war prices

42 The figures given in the last paragraph compare as follows with pre-war prices, taking the latter as Rs 100 in each case —

Rails	125
Angles and Channels	120
British beams	125
Continental bars	110
Galvanised sheets	146

It is noticeable that the price level is highest where the British manufacturer has least to fear from continental competition, *i e*, in the case of galvanised sheets In the case of most commodities post-war prices are still at least 60 per cent above pre-war prices, and the fact that steel prices have temporarily settled down at a much lower level is significant

Reasons for low level of steel prices

43 The explanation of the low range of steel prices is not really obscure More economical methods of manufacture will account for part of it, and the establishment in Belgium and Northern France of thoroughly modern and up-to-date plants in place of those destroyed during the war Something must also be attributed to the general depreciation of the continental exchanges, though we do not rate this influence very high except as a temporary factor But in the main, the explanation is to be found in an immense decrease in the world's consumption of steel, coupled with a simultaneous increase in steel manufacturing capacity This broad statement is, of course, subject to qualifications The production of steel ingots and castings in the United States of America has risen from about 31 million tons in 1913 to about 44 million tons in 1923, but in that country consumption and productive capacity have increased together, and steel exported from the United States is not at present an important factor in the world's export markets But if the United

States be excluded, the world's steel production has dropped* from 41 million tons in 1913 to 28 million tons in 1923 It is estimated that the British plant is capable of producing about 50 per cent more than before the war The productive capacity of the steel works on the continent of Europe has also risen substantially, but owing to territorial redistributions there has been a great transference from Germany to France The latter country in 1922 and 1923 produced nearly the same quantity of steel as in 1913, and Great Britain about 800,000 tons more Belgium was just short of pre-war production, while Germany of course has produced only a fraction of its output in 1913

Recent British prices unremunerative

41 The figures show that in 1922 and 1923 the world's consumption of steel (excluding the United States) was less than two-thirds of the pre-war rate, and in these circumstances the keenest possible competition for the available markets was inevitable In the written and oral evidence we have taken we have heard much of 'dumping', but the use of this word does nothing to illuminate the subject Unquestionably the British steel manufacturer has been selling steel for export at lower prices than he accepts from British purchasers, and probably continental manufacturers follow the same practice, as the Indian manufacturer of pig iron certainly does But we have received no evidence which suggests that any deliberate policy of cutting prices is being pursued with the object of killing the industry in India The steel manufacturer, whether British or continental, is striving for the highest price he can get and, if he accepts a low price, it is because he must endeavour to keep his works occupied even if that means sacrificing all profits † The lowest prices that have been touched are not remunerative and the evidence we have taken suggests that, when the price of the ordinary kinds of rolled steel in the United Kingdom falls appreciably below £8 a ton, the margin of profit is near the vanishing point for most manufacturers It is evident indeed from the published reports of many iron and steel making firms that, at the present level of prices, steel manufacture is carried on under the greatest difficulties, and that many orders are taken at rates which leave no profit at all or even involve a loss

Prevailing prices of steel in the latter half of 1923

45 We have endeavoured to ascertain the prices at which steel of those kinds which are manufactured by the Tata Iron and Steel Company actually entered India without duty in the latter half

* These figures are taken from the Iron Trade Review of Cleveland Ohio as quoted in the "Economist" of January 5th, 1924

† It is noteworthy that when continental competition dropped after the occupation of the Ruhr, the gap between British internal and export prices at once closed up

of 1923 and our estimate is contained in the following statement in which the tariff valuations for 1924 are given for purposes of comparison —

	Tariff Board's Estimate	Tariff Valuation 1924
	Per ton Rs	Per ton Rs
Steel bars and rods, ordinary—		
½ inch and under in diameter	140	150
Other sizes		135
Structural shapes, *i e*, angles, beams, channels, etc	145	150
Rails, 30 lbs and over	140	
Plates, ordinary	150	150
Sheets, black	200	175
Sheets, galvanised	300	300

Our estimate is based on quotations in the trade periodicals, corrected in accordance with the record of prices in particular transactions, where these were available, with quotations obtained by importing firms and with general information bearing on the reliability of the public quotations For steel of those kinds which are usually imported from England, *e g*, rails and sheets, the English prices were allowed most weight, while in other cases, some importance was given to Continental prices, chiefly Belgian The other components of the Indian price—freight, insurance, landing charges, etc —are based on the quotations in the Monthly Market Report, August 1923, for the kinds of steel in question Lower freight rates appear occasionally to have been obtained towards the end of 1923 than those of August, but there is no indication of any permanent decline in freights All prices have been converted into Indian currency at Rs 15 to the pound sterling

Future course of steel prices

46 The difficulty of forecasting the future course of prices is obvious They must be profoundly influenced by political factors which are wholly incalculable and the interaction of the various elements of the problem is of extreme complexity There are, however, two influences tending in opposite directions which should be noted—

(1) Prices can hardly remain for a long period at the lowest level because manufacturers cannot continue indefinitely to produce steel at unremunerative prices

(2) Any revival of trade which substantially increased the demand for steel would at once bring into play a good deal of plant which is now lying idle or is only partially employed This would operate to retard any general advance in the price level,

17 We have taken the prices given in paragraph 45 as the basis of our recommendations They are above the lowest figures at which steel has actually entered India in the last two or three years, and it is quite possible that they may again fall to the same level Should such a relapse occur and persist for any prolonged period the situation must, we consider, be dealt with by the exercise of the special powers which we have proposed (Chapter III above) should be conferred on the Government of India On the other hand we have considered whether, having regard to the recent rally of steel prices in Great Britain, the basic prices we have given should be raised We do not find, however, any sufficient reason for a modification of this kind It is doubtful whether the higher British prices are likely to be permanent, nor is it clear whether export prices have risen to the same extent as internal prices There is no evidence, moreover that there has been any corresponding change in steel prices on the Continent of Europe, nor is there any indication that competition from that quarter is likely to be less severe in the future than it has been in the past The average prices likely to obtain during the next two or three years should be somewhat above low-water level, but there is as yet no evidence which would justify the belief that a general and permanent recovery of prices is imminent

Prices taken as basis of recommendations are above lowest figures at which steel has entered India

The estimate of the imported price of bars requires some further explanation Most of the bars manufactured by the Tata Iron and Steel Company are made to fulfil definite specifications and therefore, for much engineering and constructional work, command a higher price than the ordinary Continental bars which are commonly sold without any definite guarantee of quality On the other hand the Indian product already competes with Continental bars in markets where it has an advantage in internal freight charges and will do so to a greater extent as production increases But the total estimated output is only 45 000 tons whereas the present annual Indian consumption is about 155,000 tons and the Indian producer therefore can only hope to command a part of the market In these circumstances we took as our estimate of the price of imported bars a figure distinctly above the lowest prices at which Continental bars are likely to come in but also below the full price of Standard English bars It may be that the increase in the price of bars due to the imposition of a higher duty would lead to a more extensive use of the cheaper Continental bar in place of the standard British bar and so restrict the market for the Indian product In that case it would be necessary to adopt a lower price than Rs 140 a ton as the price at which bars were likely to be imported into India without duty But we do not consider it necessary to provide for a contingency that has not yet

arisen, and for this reason we have adhered to Rs 140 as the basic price of imported bars for our purposes So long as the annual output of bars at Jamshedpur is less than 50,000 tons, it is not necessary that the Indian product should compete successfully with Continental bars in every Indian market or in all circumstances

CHAPTER V.

Cost of producing steel at Jamshedpur in 1921-22.

48. In the last Chapter we gave our conclusions as to the price at which steel is likely to enter India from abroad. We now turn to the second price which is fundamental in our scheme, *viz.* — the price at which the Indian manufacturer can sell steel at a reasonable profit. Before it can be determined, it is obviously necessary to investigate the cost of production, which includes both the works cost and the overhead charges. The works costs cover all purchases of material and all wages and salaries paid at Jamshedpur and at the ore mines and limestone quarries, but no similar payments at the Company's coal mines which for this purpose are treated on a semi-independent footing, the coal brought to Jamshedpur being charged at an all-round rate sufficient* to cover the mining cost at the mines. The other charges, which have been classed as overhead, include—

(a) Interest on the manufacturer's working capital.

(b) The expenses of the head office and the Agents' commission †.

(c) Depreciation.

The third element in the selling price is the manufacturer's profit, and before this can be ascertained, a preliminary analysis of the capital account is essential. These three factors (*a*) works costs (*b*) overhead charges, and (*c*) the manufacturer's profit will form the subject of this Chapter and the next.

The method of investigation.

49. We have found it advisable to divide our examination of this branch of the subject into two stages. The first step is to ascertain the cost of producing steel in India under post-war conditions in the Company's old plant which has been in operation since 1912, and for that purpose to select for detailed study the accounts of one particular year. It would

The costs of 1921-22 and comparison with those of 1916-17.

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* See paragraph 84 below.

† The head office of the Tata Iron and Steel Company is located in Bombay and the agents are Messrs Tata & Sons, Limited. Charges of this kind must be incurred by any firm manufacturing steel in India, and the system of Managing Agents is an integral part of the Indian industrial organization as it exists at present.

have been natural to utilize the figures of the last complete year (1922-23), but we were unable to do so because—

(1) The results were seriously affected by the general strike at the works which brought the manufacture of steel to a standstill for nearly six weeks, and

(2) Complications were introduced by the fact that in 1922-23 certain portions of the new plant had begun to work but were not in full operation, *e g*, one of the tilting steel furnaces, the plate mill and the Wilputte coke ovens.

Of all the post-war years, 1921-22 was least affected by labour troubles, and the only part of the new plant then in operation was the third blast furnace We have therefore concentrated our attention upon it It was necessary also to investigate the reasons for the continuous increase in the cost of production during the last six or seven years, and for comparative purposes we selected the year 1916-17, when the cost of production was the lowest in the history of the Tata Iron and Steel Company It is the works expenditure which is chiefly in issue in this comparison, but we have extended it to the overhead charges also, partly for the sake of completeness, and partly because in the tabular statements, in which the case for the Company was first presented, the rise in the overhead charges per ton was a very noticeable feature The cost of production in 1921-22 will be discussed in this chapter on the lines indicated above

Future cost of production from 1921-22 onwards

50 The second stage has reference to the future rather than to the past Conditions have changed to some extent since 1921-22, and it would be necessary in any case to bring that year's figures up to date But the most important change is the approaching completion of the new plant comprised in the extension scheme, which from 1924-25 onwards will be responsible for the greater part of the output of iron and steel This is an entirely new factor for which, under whatever difficulties, allowance has to be made in our recommendations The cost of production and the reasonable selling price under the conditions likely to prevail during the next two or three years form the subject of Chapter VI Both this chapter and the next are concerned with similar problems, but in the latter it has proved convenient to reverse the order in which the topics are discussed In dealing with the figures of 1921-22 we have commenced with the works costs, where the facts were most readily ascertainable, and then handled in succession the overhead charges and the manufacturer's profit But looking to the future, we have felt constrained to take first the capital cost of the extension scheme, both because of the

suggestion to modify made that the purchase of the new plant [illegible] the main reason why the Company are unable to [illegible] a profit in competition with imported steel, and to [illegible] the cost of operating the new plant is necessarily a matter of conjecture rather than of ascertainable fact

Works Costs

Works costs of 1921-22 The figures

11 We now turn to the works costs of 1921-22 as compared with those of 1916-17 The following table compares the most important figures of the two years —

—	Works cost per ton 1916-17	Works cost per ton 1921-22	Percentage of increase
	Rs	Rs	
Pig iron	18 54	31 17	68
Steel ingots	41 13	68 82	67
Rails	75 17	116 00	54
Average cost of all marketed steel	77 23	120 41	56

It will be seen that the increase is highest in the case of pig iron, the stage of manufacture at which the cost of coal is the main factor Between 1916-17 and 1921-22 the cost of coal at Jamshedpur rose from Rs 3 8 to Rs 8 a ton, while simultaneously the quality deteriorated the percentage of ash in the coke rising from about 20 to 24 The immediate result* was an increase in Rs 8 4 in the cost of pig iron, or more than half the total increase Only half the coal employed at the works, however, is coking coal, and the price of the other half directly affects the latter stages of manufacture Out of a total increase of Rs 41 per ton in the cost of rails coal is responsible for at least Rs 18 The other main factors affecting costs at all stages were—

(1) An increase in the wages of labour at Jamshedpur of between 40 and 50 per cent Higher wages at the ore mines and limestone quarries similarly raised the cost of essential raw materials

(2) A general increase in the price of all purchased materials and consumable stores

* The figure given in paragraph 11 will serve to show how an increase in cost at one stage is carried on to later stages In 1916 17 only 1 66 tons of coking coal were required to make a ton of pig iron and in 1921 22 1 78 tons Had the quality of the coal not deteriorated, the rise in the price of coal would have increased the cost of pig iron by about Rs 7 5 a ton only

operation made some temporary increase in number inevitable, and the larger quantity of surplus pig iron available for sale (10,000 tons instead of 40,000) involved the employment of more men at the blast furnaces, owing to the extra handling required by the cold pig on its way to the market, as compared with the hot metal transferred direct to the steel furnaces.

Labour costs. Covenanted hands.

55. The labour cost per ton of finished steel at Jamshedpur is unquestionably higher than the corresponding cost in western countries. This is due not only to the higher wages paid to the skilled labour imported from abroad, but also to the much larger number of unskilled and semi-skilled labourers employed, so that the total wages per ton come out higher. The total wages of the covenanted men employed in 1921-22 in the five* important producing departments was Rs. 1·5 lakhs. Mr. R. D. Tata informed us in the course of the oral evidence that the wages of Indians appointed to similar posts would probably be one-third less, and the eventual saving intended is therefore over Rs. 3 lakhs, or, if allowance be made for the covenanted hands in other departments, Rs. 4 lakhs. The incidence of the sum of Rs. 6·5 lakhs mentioned above is about Rs. 6 per ton of finished steel, and the extra cost as compared with western countries is about Rs. 4 per ton. This is a handicap which will diminish as time goes on and Europeans and Americans are replaced by Indians. Good progress in this direction has already been made. The number of covenanted men employed in each department in 1919-13 and in 1921-22 compares as follows:

	Number of covenanted men employed	
	1919-13.	1921-22.
Coke ovens	6	11
Blast furnaces	23 on 9 furnaces.	21 on 8 furnaces.
Steel furnaces	61 on 4 furnaces	64 on 7 furnaces
Mills	32	31

Cost of unskilled and semi-skilled labour.

56. The question of the unskilled and semi-skilled labour stands on a different footing. In the steel industry, as in other industries in India, low paid labour is not cheap labour and the number of men employed is naturally much higher than in western countries. We have made full allowance for that fact, and for the effect on the pay rolls of the absenteeism unfortunately too common in this country, but the impression left on our minds, nevertheless, is that the labour staff at Jamshedpur in 1921-22 could

* The blast furnaces, open hearth furnaces, blooming mill, rail mill and bar mill. No covenanted hands have been employed at the coke ovens since 1919.

have been reduced without loss of efficiency We do not suggest that, even had the strictest economy been observed, the difference in the cost of finished steel would have been more than one or two rupees per ton, and we believe that the Company were hampered in this matter by the grave labour unrest of the last four or five years, and by a natural anxiety to avoid reductions of staff which might easily have led to a strike and a complete stoppage of work But the matter is of considerable importance, for strict economy is necessary if the industry is to survive As men are gradually transferred to the new plant, it should be possible to leave some of the vacancies in the old plant unfilled

The cost of coal

57 The cost of coal in 1921-22 could not have been reduced The figure charged in the cost accounts is the price paid 'free on rail—collieries' for purchased coal (Rs 6 6 per ton) *plus* freight to Jamshedpur During the same year the Company sold from its own collieries a quarter of a million tons at an average price of Rs 8 43 a ton It was therefore purchasing well below the market rate

Reduction on the output of the steel furnaces

58 We have no doubt at all that the Company were right when they decided after the war that a high standard of quality was essential, even if the outturn of steel declined heavily The whole future of the industry depended on their ability to prove that steel of thoroughly sound quality could be produced in India This has now been done, and the outstanding problem is to combine quality with a higher output For climatic reasons this is a more difficult task in America* than in England, and more difficult in India than in America During the hot weather months it is a very arduous business for the man in charge to keep the close watch over the furnaces which is essential Nevertheless, we believe that in the stationary open hearth furnaces a higher output is possible and will be secured When the new plant is in operation the Company will be making a larger variety of products, and the same uniformity in the composition of the steel ingots will not be necessary Steel that is too soft for structural shapes may, for example, be used for sheets It will also be possible to use more steel scrap in the metallic mixture, and thus diminish the total quantity of impurities to be removed and the time taken in their removal Improvements in the quality of the refractory materials used will reduce the periods when the furnaces are closed down for repairs Finally the duplex process, which is to be adopted in the new plant in place of the stationary open hearth furnaces, is expected to lead to a much higher output of steel ingots

* Both in America and in India the furnace fronts are water cooled, a measure which is not usually considered necessary in Europe

Conclusions regarding the works costs in 1921-22

59. Our general conclusion regarding the works costs at Jamshedpur in 1921-22 is that, in all the circumstances they were reasonable and that, subject to what is said in paragraphs 54 and 56, they could not have been substantially reduced. Much of the old plant, and particularly the rolling mills, is no longer up to date and is unquestionably expensive to operate. Again, while we believe that better results will eventually be secured from the open hearth furnaces we find no justification for holding that these could have been obtained two years ago The steel industry in India is still in its early adolescence, a period when experience has to be purchased, and economical production is largely a matter of experience Finally, the Company are in no way responsible for the heavy increases in prices and wages nor for the time when they occurred. It is sometimes forgotten that, whereas in Europe wages and prices increased during the war and have fallen heavily since 1920, in India most of the increase took place after hostilities had ceased. It is this fact which supplies the answer to those who complain that the cost of steel production in India was still rising when in other countries it was falling. The cost of coal at Jamshedpur was still Rs 5 a ton in 1918-19 and the first increase in wages since 1914 was given in 1919-20.

II. Overhead Charges—Analysis of the Capital Account.

Necessity for an analysis of the capital account

60. We now turn to the other elements in the costs of production. Before we could determine the overhead charges in 1921-22, we found it necessary to make a close analysis of the capital account The Company had already expended very large sums on the extension scheme, and part of the share capital raised in order to finance the scheme was entitled to dividends. It by no means follows, however, that the whole of that capital had contributed to the production of iron and steel in 1921-22 or could be taken into account in the costs of that year The figures originally put forward by the Company we were unable to accept, and we found it necessary to proceed on independent lines Our final conclusion is that a sum of Rs 400 lakhs is a fair estimate of fixed capital expenditure corresponding to the production of 1921-22, and we shall explain how this figure was arrived at

Exclusion of the capital expenditure on the collieries

61 We found it necessary to exclude in the first place the capital expenditure on the collieries During the last six years the Company has sold nearly a million tons of coal produced from its own collieries, or more than a third of the total output. Eventually, when development is completed, the company expect to produce about two million tons of coal, while their purchases

realised a profit exceeding Rs 50 lakhs In these circumstances we consider that the sum of Rs 400 lakhs may be taken as the fixed capital expenditure corresponding to the production of the year 1921-22

Cost at present day price of erecting steel works of the same capacity as those at Jamshedpur

61 It would be impossible at present-day prices to construct in India a plant with a productive capacity similar to that of the works at Jamshedpur in 1921-22 (126,000 tons of finished steel and 270,000 tons of pig iron) for the sum of Rs 600 lakhs We estimate that for this purpose a sum of Rs 600 lakhs would be necessary if the cost of the ore mines, limestone quarries and the town are included The higher cost is due not only to the rise in prices since pre-war days, but to the fact that more elaborate and expensive plant is now considered necessary in order to secure economical production New works erected now would have to provide a return on a higher capital than the Jamshedpur works but the operating expenditure should be very distinctly lower The importance of the figure of Rs 600 lakhs lies in the fact that in fixing the allowance to be made for depreciation, the manufacturer has to be guided not by the book value of his property or its original cost but by the cost of replacement at present-day prices

Estimate of the cost of the works to be erected by the United Steel Corporation of Asia

65 In arriving at a figure of Rs 600 lakhs as the cost of an up-to-date plant with about the same capacity as the Jamshedpur works in 1921-22, we have considered the estimate prepared in 1922 for the United Steel Corporation of Asia by Messrs Cammell Laird & Co of Sheffield The Corporation who will act as technical advisers to the firm propose to make a start with an instalment (about one-fourth) of their full scheme, and the outturn expected is 140,000 tons of steel and 180,000 tons of pig iron This estimate comes to just over Rs 600 lakhs, excluding the reserve for contingencies and any provision for the mines and quarries or for the town On the other hand the rolling mills, the water and hydraulic system and the power station will be constructed so as to make provision in advance not only for the needs of the first instalment, but, to a large extent, of the complete scheme The deductions to be made from the estimate on this account are counterbalanced by the additions which must be made on account of the mines and quarries and the town

The overhead charges

66 We are now in a position to deal with the overhead charges

(1) *Interest* —The figures given in the Company's cost accounts are based on the actual interest paid in each year on

debenture and other loans On this method of calculation the Company required six times as much working capital in 1921-22 as it did in 1916-17, a result which could not be accepted when the outturn of steel had gone up by only 27 per cent After a close examination of the subject we were satisfied that Rs 200 lakhs was approximately the working capital actually required in 1921-22 and that the corresponding figure in 1916-17 was about Rs 100 lakhs The increase in production accounts for about one-third of the difference, and the rise in prices between the two years is a sufficient explanation of the balance In 1916-17 the Company could borrow at 6 per cent , whereas in 1921-22 the rate was 7½ per cent The total requirements on account of interest therefore were—

	Rs
1916-17 . .	6 lakhs
1921-22	15 lakhs

(2) *Bombay expenses and Agents' commission* —There is little difference in the Bombay expenses between the two years, but the Agents' commission was Rs 10 lakhs in 1916-17 and Rs 3½ lakhs in 1921-22 The amount of the commission depends on profits, and variations in profits are not relevant in an enquiry into costs We have therefore taken for comparative purposes the 1921-22 figure for these items (Rs 7 31 lakhs) in both years

(3) *Depreciation* —In 1916-17 the allowance for depreciation was Rs 21 5 lakhs In 1921-22 the reasonable allowance must, we consider, be determined by the cost at present prices of replacing the old works The replacement cost we have found to be Rs 600 lakhs (paragraph 64 above) Depreciation at 6¼ per cent on this sum amounts to Rs 37 5 lakhs

Final comparison of production costs in 1921-22 and 1916-17

67 The detailed comparison of the results of the years 1916-17 and 1921-22 is as follows —

	1916-17	1921-22
	Rs	Rs.
Works cost per ton . .	77 24	120 41
Overhead per ton	32 17	38 24
Total cost per ton	109 41	158 65

The works cost given above are the averages for rail mill and bar mill products taken together In order to distribute the overhead charges between steel and surplus pig iron, the output for the year in each case has been multiplied by the works cost per ton, and the charges divided in the same ratio as the one result bears to

the other * The figures are therefore approximate but we believe they are reasonably accurate

Manufacturer's Profit

Manufacturer's profit

68 We have now to determine the selling price which would have given the Company a fair return on the capital investment We have found that Rs 100 lakhs was the capital expenditure incurred and it only remains to determine the rate of interest The evidence we have taken has satisfied us that the rate on ordinary shares cannot be put at a lower figure than 10 per cent As for the remainder of the capital, it is not necessary to discuss on abstract grounds what the figure should be, for the best evidence of the rate at which capital can be raised is the rate at which it has actually been raised in the past The original share capital of the Company—Rs 231 75 lakhs—consisted of ordinary, deferred and 6 per cent first preference shares, and the balance of the total of Rs 400 lakhs consists of 7½ per cent second preference shares The details are as follows —

—	Amount	Rate of interest	Interest payable
	Rs lakhs	Per cent	Rs lakhs
Ordinary and deferred shares	156 75	10	15 67
First preference shares	75 00	6	4 50
Second preference shares	168 25	7½	12 63
Total	400 00	8 2	32 80

The average rate of interest on the whole capital is just over 8 per cent ; and it is most unlikely that any other company could have obtained the money more cheaply If the sum of Rs 32 8 lakhs be distributed between steel and surplus pig iron by the

* The method of allocation adopted may be illustrated from the figures of 1921 22

	1 Quantity produced	2 Works cost per ton	3 Total works cost (1) multiplied by (2)
	Tons	Rs	Rs lakhs
Surplus pig iron	107,000	34 17	36 88
Finished steel	125,873	120 11	188 45

The total overhead to be allocated is Rs 59 81 lakhs If this is apportioned in the ratio of 36 88 to 188 45, the share of the surplus pig iron is 11 68 lakhs and of the finished steel 48 13 lakhs If the latter figure is divided by the total production of finished steel, the incidence per ton is Rs 38 24

method indicated in the last paragraph, the incidence per ton of steel is Rs 20 96 The average selling price which would have given the manufacturer a fair profit is therefore Rs 179 61—or in round figures Rs 180 a ton arrived at as follows .—

	Per ton Rs.
Works cost	120 41
Overhead charges .	38-24
Manufacturer's profit . .	20-96
Total .	179 61

Average price at which steel was sold in 1921-22

69 In 1921-22 the average price realised by the Tata Iron and Steel Company for all finished steel was Rs 159 a ton, which just sufficed to cover the overhead charges and left no profit whatever The average price was however affected by the contracts made with the Bengal Nagpur Railway Company and the Companies known as the Palmer Railway Companies for the supply of rails and fishplates If the Companies had paid at the same rates as the Railway Board. the Iron and Steel Company would have received an additional sum of nearly Rs 17 lakhs which is equivalent to 4¼ per cent on a capital of Rs 400 lakhs The average price obtained for finished steel would have risen by Rs 13 36 a ton from Rs 159 to Rs 172-36

Average price at which steel was sold in 1922-23

70 The price of steel was still comparatively high in the early months of 1921 but fell continuously throughout the year The results of 1922-23 were naturally therefore, much worse In spite of the increase in the customs duty from 2½ to 10 per cent., the average price received for all finished steel dropped to Rs 142 56 per ton Here also the rail contracts made a substantial difference Had payment been made in all cases at the Railway Board rates the average price would have risen by Rs 10 9 per ton to Rs 153 46 Even on the 1921-22 costs this meant a loss of Rs 5 19 per ton But owing to the increase in the price of purchased coal from Rs. 6 6 to Rs. 8 96 per ton, there had been an increase in 1922-23 of approximately Rs. 9·5 in the works cost of steel and the loss was raised to Rs 14 69 per ton It is evident we think that at the present level of prices and with the present customs duties the manufacture of steel in India can only be carried on at a loss

CHAPTER VI.

Future cost of production and price which will enable Indian manufacturer to sell at a reasonable profit.

71 As indicated in paragraph 50, we shall discuss in this Chapter the cost of production at Jamshedpur when the new plant is in full operation, *i e*, from 1924-25 onwards, and for the reasons given there we shall begin with the capital account It has frequently been suggested that, if the construction of the new plant had been postponed until prices had reached their normal post-war level, the capital expenditure incurred would have been much lower, and that then there would have been no difficulty in selling steel at a profit in competition with imported steel We have examined closely the question how far the capital account has been swollen by purchases at a time of high prices, and we shall set forth the results of our enquiry But it is perhaps worth while to make two points clear at the outset We have already shown at the end of the last Chapter that the manufacture of steel in the old plant at Jamshedpur in 1922-23 involved a heavy loss, and the same is true of 1923-24 Had the Greater Extensions been completed in 1921, as the Company originally hoped they would have been much better equipped to face the period of low prices In the second place, if the commencement of the extension scheme had been postponed till 1922, it is more than likely that the steel works would have closed down before now But for the profits made on the surplus pig iron during the last three years, the manufacture of steel at unremunerative prices could hardly have continued But the surplus pig iron was produced by the new blast furnaces which are an integral part of the extension scheme, and if there had been no extensions there would have been very little pig iron to sell The purchase of the third blast furnace (sometimes called the Batelle furnace) has been specially criticized on the ground that it cost much more than it was worth It is a sufficient reply to this criticism to point out that it cost less than Rs 40 lakhs and more than paid for itself in a single year by the profits on the surplus pig iron it produced

Preliminary The capital account

The Capital Account

72 By the 31st of March 1924, the works included in the extension scheme will be practically complete, and the whole of the new plant will come into operation in 1924-25 The fixed capital expenditure of the Company will then, it is estimated

Capital account on 31st March 1924

amount to Rs 21 crores* We have no hesitation in saying that this sum is greatly in excess of the present value of the property, whether regard be had to the profits which might be earned, or to the cost of replacement at present-day prices It is necessary, however, to deduct in the first place the capital expenditure on the collieries (Rs 205 lakhs) and second depreciation at income-tax rates on the whole plant up to the 31st March 1924 (Rs 215 lakhs) The balance is Rs 16½ crores, and the real question is to what extent this figure exceeds the cost at present-day prices of constructing iron and steel works with a similar output Unquestionably the new plant was purchased during a period when prices were very high, and the natural inference is that it could be purchased much cheaper to-day

Estimated cost of the iron and steel works projected by the United Steel Corporation of Asia

73 The best evidence available of the probable cost of erecting in India works with a productive capacity of over 600,000 tons of pig iron and over 400,000 tons of finished steel is the estimate for the complete scheme contemplated by the United Steel Corporation of Asia It amounts to Rs 15½ crores including, and Rs 15 crores excluding, the development of the Corporation's coal mine So far as the technical equipment is concerned the estimate was prepared by Messrs Cammell Laird and Co , and brought up to date on the basis of 1922 prices The output expected—700,000 tons of pig iron, of which 100,000 tons will be surplus, and 450,000 tons of finished steel—is rather higher than the output expected at Jamshedpur, but the two schemes are comparable Indian experience in connection with estimates does not justify the belief that the actual expenditure incurred on the Corporation's plant would be appreciably smaller than Rs 15 crores

American purchases for the new plant at Jamshedpur

74 In so far as the question can be investigated in other ways, the evidence tends to support the figure of Rs 15 crores as the probable cost to any firm of works similar in magnitude to those of the Tata Iron and Steel Company The data available are very imperfect, but they give some assistance The new plant at Jamshedpur was purchased almost entirely in America and the total orders placed amounted to 21 307,367 dollars The remittances were made at an average rate of Rs 3 22 to the dollar, and the American purchases amounted therefore to nearly Rs 7 crores which is about half the total cost of the extensions We have not been able to ascertain the changes in the prices of plant and machinery in America during the last

* If the Company's investments be added, the total is about Rs 22 crores Clearly, however, the investments must pay for themselves and we have not taken them into account

ten years, but the general course of steel prices may serve as an index of the way things were moving A composite price of finished steel products including bars, beams, tank plates, wire, rails, pipes and black sheets is published annually by the Iron Age, and we have calculated what the reduced cost of the American purchases would have been if made at the present level of prices, instead of at the higher rates which actually prevailed The underlying assumption, of course is that the prices of machinery varied in about the same proportion as general steel prices On this basis the present price of the new plant would be approximately 15,570,000 dollars which is less by 5,730,000 dollars than the price actually paid This is equivalent to a saving of Rs 184 lakhs at the average rate of remittance

Transit charges on the new plant purchased in America

75 The balance of the cost of the Greater Extensions—apart from minor purchases in Europe—consists of transit charges (freight, insurance etc) and expenditure incurred in India on erection The transit charges would be enormously lower to-day, but there seems to be no reason for thinking that the cost incurred in India would be less, for wages are not lower and coal is much higher The Company have furnished us with full details of the cost (erected at Jamshedpur) of parts of the plant the aggregate cost of which, f o b at an American port, was Rs 264 lakhs The total transit charges were Rs 50 lakhs and, as the plant was shipped in several different years the figures give a fair idea of the average transit charges The transit charges on the whole plant would then amount to about Rs 130 lakhs and, making every allowance for the heavy fall in freights we cannot put the excess payments over present-day rates higher than Rs 70 lakhs

Low cost of the old plant

76 The excess payments in America (Rs 184 lakhs) and the higher transit charges (Rs 70 lakhs) justify a reduction in the capital expenditure of Rs 2¼ crores Against this, however must be set off the fact (already alluded to in paragraph 64) that the old plant could not be replaced to-day at its original cost We estimated that the difference between the original cost and the present cost of a plant with the same output would be about Rs 200 lakhs But a plant of this size is too small for economical production under present-day conditions, and the difference in the case of a plant with treble the capacity would not be so great The cost at present-day prices of a plant producing annually 130 000 tons of finished steel may be put at Rs 6 crores but the cost of a plant with a capacity of 400 000 tons would not be more than Rs 15 crores The replacement value of the old plant at Jamshedpur is therefore Rs 6 crores if

it is considered as a separate unit, but only Rs 5 crores if it is treated as a part of a larger organisation It is sufficient therefore to allow Rs 1 crore on account of the low cost of the old plant The net reduction in the cost of the works as a whole is then Rs 1½ crores which brings down the final figure from Rs 16½ crores to Rs 15 crores

77 The net result of these calculations can best be exhibited in tabular form —

Final calculation of the cost of the Jamshedpur works at present prices

	Rs Lakhs
Original cost of old block	400
Collieries	200
Greater Extensions	1,500
Total	2,100
Add—Allowance for increased cost of replacing the old block at present prices	100
Grand Total	2 200
Deduct—	
(1) Capital expenditure on the collieries	200
(2) Expenditure from the depreciation fund	250
(3) Excess expenditure on American purchases and freight, etc	250
Final Total	1,500

In effect what has been done is to write up the old plant from Rs 4 crores to Rs 5 crores on the ground of the rise in prices since before the war, and to write down the Greater Extensions from Rs 15 crores to Rs 10 crores Half the reduction is due to the high prices at which the new plant was purchased, and half to the fact that part of the expenditure on the new plant goes to replace the old To a large extent indeed the old plant is already replaced The rolling capacity of the new mills is in excess of the capacity of the steel furnaces to produce ingots, and it is far from improbable that, when the new mills have been tuned up, the old mills may be closed down It may be added that, if the duplex process justifies the expectations formed of it, the addition of a third tilting furnace at a comparatively small cost would almost render it possible to dispense with the open hearth furnaces The old blast furnaces are still efficient and have many years of life before them

The Manufacturer's Profit

78 The capital expenditure required for the construction of iron and steel works with an outturn of over 600,000 tons of pig iron and over 400,000

The Manufacturer's profit

tons of finished steel has been found to be Rs 15 crores On this basis the return on the capital investment can be ascertained The Company's share and debenture capital amounts to Rs 16½ crores divided as follows —

—	Amount	Rate of interest	Interest payable
	Rs Lakhs	Per cent	Rs Lakhs
First preference shares	75 00	6	4 50
Second preference shares	700 00	7½	52 50
Ordinary and deferred shares	277 12	10	27 71
Debentures	600 00	8	48 00
Total	16,52 12	8 03	132 71

It will be seen that the entire capital has been raised at an average rate of 8 per cent Interest on Rs 15 crores at the same rate comes to Rs 120 lakhs and it is this sum which has to be found from the sale of iron and steel

Probable profits on the pig iron

79 When the full production of steel is attained the surplus pig iron will be about 40,000 tons This amount does not exceed the normal surplus which any steel manufacturer with an output of 400,000 tons of steel and making his own pig iron would provide for Some reserve capacity for pig iron is necessary, since otherwise there is a risk that the steel furnaces might be put out of action for want of the necessary raw material, and within the limits of this surplus the profits on the pig iron may fairly be taken in reduction of the profits expected from the steel The year 1921-22, however, was altogether abnormal, both in respect of the quantity of surplus pig iron (107,000 tons against 126,000 tons of finished steel) and the average price obtained (Rs 94 a ton) which left a profit of nearly Rs 50 a ton Three companies are now competing in the Indian and export markets for pig iron and the price especially in the export market, has fallen heavily It would not be safe to estimate the average profit per ton at more than Rs 20 in the future, and on 40,000 tons this means a total profit of Rs 8 lakhs This reduces the return which the sale of steel has to provide from Rs 120 lakhs to Rs 112 lakhs and with an output of 420 000 tons the incidence is Rs 26 67 per ton

Overhead Charges.

80. We turn now to the overhead charges on the full production, and the first item is interest on working capital. The Company have estimated the sum required at Rs. 500 lakhs. Excluding the provision for the collieries the total comes to Rs. 445 lakhs divided as follows :—

The overhead charges—Interest on working capital

	Rs. Lakhs.
Stores and spare parts of all kinds	180
Raw materials and refractory articles . . .	75
Outstanding and stocks of finished products .	190
Total	445

No reduction is necessary under the second head but both the others are, we think, over-estimated. The total expenditure in 1922-23 on stores and spare parts of all kinds was in the neighbourhood of Rs. 50 lakhs, and is not likely to exceed Rs. 120 lakhs when the new plant is in operation. Making every allowance for the fact that the Indian manufacturer has to keep a much larger stock of spare parts and other stores than the European or American manufacturer owing to the difficulty of obtaining supplies at short notice we cannot see why the stock should be equal to eighteen months consumption. We have checked the various items and we think Rs. 110 lakhs should suffice. The over-estimate under the third head arises from the fact that the stocks of finished goods have been valued at their selling price instead of on the basis of the out-of-pocket expenditure actually incurred. The reduction to be made here is Rs. 25 lakhs. The working capital required then stands at Rs. 330 lakhs and interest at 7½ per cent. amounts to Rs. 26·25 lakhs. The provision for raw materials, outstandings and stocks of finished goods is equivalent to about six months production.

81. The other overhead charges do not require a lengthy discussion.

Other overhead charges.

(1) *Bombay expenses and Agents commission.*—The Company estimate the head office expenses at Rs. 4 lakhs, which is a reasonable figure. The Agents commission under the terms of their contract, on the assumption that the full dividends are earned is Rs. 8·4 lakhs.

(2) *Depreciation.*—The allowance for depreciation may be taken at an all-round rate of 6¼ per cent. on Rs. 15 crores, and the amount required is Rs. 93·75 lakhs.

82 The surplus pig iron cannot be debited with more than about 2½ per cent of the overhead charges and the rest has to be earned by the steel The figures we have arrived at compare as follows with those of 1921-22 —

Final charge of overhead charges

	Incidence per ton of finished steel	
	1921-22	After full production is attained
	Rs	Rs
Interest on working capital	0 69	0 61
Bombay expenses and Agents' commission	1 67	2 89
Depreciation	23 97	21 72
Total overhead	38 21	30 70
Return on capital investment	20 96	26 67
Total	59 20	57 37

The overhead charges should be distinctly lower when the new plant is in full swing, but a larger sum per ton is required as interest on fixed capital The latter result was to be expected, as the new plant is more elaborate in type and consequently its original cost is higher

Works Costs.

83 The average works cost of finished steel in 1921-22 was Rs 120 41 per ton, but two years have elapsed since then, and there may be reasons for reconsidering that figure In one respect only the conditions have materially changed, *viz*, the rise in the price of coal The Company purchases coal under long term contracts by which the price is fixed at the price paid by the Railway Board for similar coal or at a figure eight annas higher The Railway Board itself, however, entered into contracts covering a period of three years from 1st April 1922 to 31st March 1925 at prices considerably higher than those paid previously, and increasing by 12 annas a ton in each of the second and third years We shall refer again to the Company's coal contracts in a later paragraph (see paragraph 103 below), and the only point we desire to make here is that under their operation the increase in the cost of coal was unavoidable,

Rise in the price of coal since 1921-22

Works costs in 1922-23

84 In 1922-23 the price of purchased coal free on rail-collieries rose from Rs 6 6 to Rs 8 96 per ton According to the Company's cost accounts the average cost of finished steel in that year is Rs 128 84 a ton but in fact this figure should be higher Had the coal been charged in the cost accounts at the purchase price *plus* freight as in previous years the average cost of finished steel would have been approximately Rs 135 per ton But owing to a change of system, coal is now charged at the average of the price paid for purchased coal and the raising cost of coal from the Company's own collieries *plus* freight to Jamshedpur in both cases This new system is not consistent with the principle we have adopted that the collieries should be treated as financially independent and for our purposes the steel cost must be taken at Rs 135 On the other hand it was stated in evidence on behalf of the Company that except in the price of coal there was no important change in 1922-23 and the higher price only accounts for a rise of about Rs 9 5 over the costs of 1921-22 The average cost may therefore be put at Rs 130 and the balance of Rs 5 is attributable to the strike

Works costs in 1923-24

85 In 1923-24 there has been an automatic increase of 12 annas a ton in the price of purchased coal and a similar increase will take place in 1924-25 Each increase is equivalent to a rise of Rs 3 a ton in the cost of finished steel at the present rate of consumption and, though there may be compensating savings in other directions there is no prospect that in the old plant at least the cost can be brought appreciably below Rs 130 a ton until 1925-26

Future works costs

86 The determination of the works cost of steel during the next three or four years must be largely a matter for conjecture The three causes which have tended to keep the cost of steel production high at Jamshedpur are—

(1) The price of coal

(2) The comparatively low output of the steel furnaces, and

(3) The fact that parts of the plant are becoming obsolete and are expensive to operate This applies specially to the rolling mills

In respect of coal no relief is possible until April 1925 for (as explained in paragraph 83 above) the price is governed by the price paid by the Railway Board which is itself fixed by a three years contract commencing in April 1922 A great improvement in the output of steel ingots is expected from the new duplex process the introduction of which is now imminent but the process has never

yet been worked in India and the best results cannot be attained at once The new mills are far more efficient than the old and the costs will be lower, but here again a high output is indispensable to economy, and the output of the mills depends absolutely on the production of ingots by the steel furnaces We do not doubt that costs will steadily diminish, but it is far more difficult to forecast the rate at which they will fall

The Company's estimate of future costs

87 At our request the company supplied an estimate of what they considered their works costs were likely to be after full production had been attained, the price of coal being taken at the same figure as in 1921-22 The estimate compares as follows with the works cost of that year —

	Cost per ton	
	Actuals 1921-22	As estimated after full production
Pig Iron	34 47	30 95
Steel ingots	68 82	58 50
Rails	116 00	95 54
Bars	135 50	112 05
Average for products of new rail and bar mills		96 30
Ditto of old mills	120 41	106 50
Ditto of old and new mills		99 00
Sheets—galvanised and black, plates and sheet bars		124 94
Average for all finished steel including sheets, plates and sheet-bars		106 46

An examination of the details of the estimate shows that nearly three-fifths of the reduction in the cost of rails, which may be taken as a typical product, is expected from the steel furnaces and about two-fifths from the new mill * Some economies are also anticipated in the working of the old steel furnaces, but in the main the company look for the savings almost entirely to the new plant On this showing, everything depends on the success of the duplex process, for the new mills will not be cheap to work unless the supply of steel ingots is fully maintained

Future cost of coal

88 The evidence we have received does not justify an assumption that the price of coal will in fact fall to the 1921-22 level during the course of the next three or four years Mr Whitworth, the Chief Mining Engineer with the Railway Board, informed us that in his opinion it was

* The reduction in the cost of pig iron does not affect costs in the later stages so much as might have been expected The Company apparently expect that the wastage of pig iron will be higher in the duplex process than in the open hearth furnaces, and that they may be unable to utilize all the scrap produced

doubtful whether good Jharia coal would ever be sold to Railways again in large quantities under Rs 9 per ton There are however causes at work which must eventually bring prices down Railway facilities are being improved the deeper mines are equipping themselves with electrical coal-cutting machinery and new coal fields are about to be opened out where at the outset the raising costs are likely to be low We do not think it is an extravagant supposition that in three or four years the average price of the coal required by the Tata Iron and Steel Company might drop to some figure between Rs 8 and Rs 9 per ton which would mean about Rs 10 per ton at the Jamshedpur works As the cost of coal at the works was Rs 8 per ton in 1921-22 an increase of Rs 2 per ton would raise the works cost of steel by Rs 8 per ton on the basis of 4 tons of coal to one ton of finished steel

Utilization of the surplus gases

89 The Company have furnished us with copies of their flowsheets showing the probable distribution of the fuel to the various sections of the plant when full production is attained The consumption of coal expected is about 4 tons per ton of finished steel and the estimate* referred to in paragraph 87 also seems to presuppose a similar rate of consumption It seems to us doubtful however whether so large a quantity will actually be required The inflammable waste gases produced in the coke ovens and the blast furnaces are a valuable fuel and the experience of other countries shows that if they are fully and efficiently utilised the coal consumption can be heavily cut down The quantities of gas which will be burnt according to the flowsheets appear to be reasonable but we can find no equivalent saving in coal The United Steel Corporation of Asia have given us figures for their coal requirements and the rate is equivalent to less than 3 tons of coal per ton of finished steel We believe that the Tata Iron and Steel Company should be able to save at least half a ton of coal per ton of finished steel as compared with their estimate and this saving would go far to counteract the higher price of coal The economy effected is not merely the purchase price of half a ton of coal there are savings in labour charges also for the gas which replaces the coal can be burnt much more cheaply

Necessity of fuel economy

90 This question of fuel economy is of first class importance We made no allusion to the subject when dealing with the costs of 1921-22 for the old plant was designed at a time when coal could be landed at Jamshedpur at Rs 3 a ton or less and there was no particular

* The estimate for the blast furnaces shows a credit for surplus gas of 12 annas per ton of pig iron and the coke ovens estimate a credit of a little over 4 annas per ton of coke If the gas is valued at its coal equivalent—which seems the natural method—the figures mean that the surplus gases displace only 80 000 tons of coal a quite inadequate figure

incentive to reduce consumption But the cost of coal seems to have risen permanently to a much higher level, and it is imperative that the fuel value of the surplus gases should not be wasted It is certain that, if new steel works are erected by another firm, every possible step will be taken to keep the coal consumption low and, if the Tata Iron and Steel Company is to hold its own, economy in fuel is indispensable

Gradual decline probable in production costs as output increases

91 We believe that the works cost of steel at Jamshedpur can be reduced to the extent indicated in the Company's estimate, but this cannot be done at once and a transition period of several years is inevitable during which the works costs should gradually fall from about Rs 130 to some figure in the neighbourhood of Rs 100 a ton There are too many doubtful factors involved to justify any confident prediction as to the rate at which costs will fall, but one point we regard as certain The full production of 420,000 tons can be attained only gradually The Tata Iron and Steel Company has always tended, we think, to be unduly sanguine as to the time within which results can be expected In order to get some definite basis on which to work, we estimate that the production of finished steel may be 250 000 tons in 1924-25, 335,000 tons in 1925-26 and about 400,000 tons in 1926-27 It is not safe to assume that a process untried in India before (*i e*, the duplex process) will give the full results expected of it until after one or two years' practical working If the actual output approximates to the figures given above, it will not be until the fourth year that prices will approach their final level

The fair Selling Price of Steel

The selling price of steel

92 We have estimated (paragraph 82 above) that, on the full production, about Rs 57† a ton will be required in order to meet the overhead charges on steel and the manufacturer's profit The third element in the selling price (*i e* the works costs) cannot, we have found, be put at a definite figure, but may be expected to drop gradually from near Rs 130 to near Rs 100 It is on this basis that we have to determine the selling price which yields a fair return on the capital investment To this branch of the subject we now turn

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	Rs per ton
*Overhead .	30 70
Manufacturer's profit .	26 67
Total .	57 37

lakhs) and the interest on working capital (Rs 26 25 lakhs) are therefore amply covered.

The selling price of Rs 180 a ton adopted as the basis of proposals made

96 The final result of the enquiries which we have summarised in Chapter V and in this Chapter is that our recommendations should be so framed as to secure to the Indian manufacturer an average selling price of Rs 180 a ton We have been conscious throughout that this part of our task was exceedingly difficult, and we have spared no pains to investigate the facts The time occupied might perhaps have been shorter if the case for the steel industry had been presented by the Tata Iron and Steel Company in a more complete form at the outset, but we desire to acknowledge cordially the readiness with which the Company complied with all our requests for information Whatever the particular subject under enquiry might be, the Company gave us every opportunity to investigate the facts for ourselves, and allowed us to inspect all documents which we desired to see We had hoped also to enlist the assistance of the business community generally in examining the cost of production and kindred questions, and it was with that object that we published in October the evidence taken at Jamshedpur in August . Our hopes were disappointed, however, and we received no criticisms on this part of the case The witnesses from whom we endeavoured to obtain opinions in oral examination explained that they could not deal with the matter without a closer scrutiny of the published evidence than either they, or the bodies they represented, had attempted We mention the fact in no spirit of complaint, but in justice to ourselves we desire to make it plain that we should have welcomed assistance from commercial men in the investigation of a very difficult question

CHAPTER VII.

General considerations affecting the Board's proposals.

97 The conclusions at which we have arrived up to this stage may be stated as follows —

Summary of conclusions

(1) India possesses great natural advantages for the manufacture of steel owing to the richness and abundance of the iron ore deposits and the comparatively short distance which separates them from the coal fields

(2) At the present time the continued existence of steel manufacture in India is in grave jeopardy and, unless protection is given there is no prospect of further development for many years to come

(3) The natural advantages are so great that eventually steel manufacture in India should be possible at as low a cost as in any other country.

(4) In the national interests it is of great importance that steel should be manufactured in India

(5) The prices at which steel of the kinds we are concerned with is likely to be imported to India without duty are —

	Per ton
	Rs
Bars	140
Structural shapes, i.e. angles, beams channels, etc	115
Rails 30 lbs and over	140
Plates, ordinary	150
Sheets black	200
Sheets galvanised	300

(6) The average price which gives the Indian manufacturer a fair return on his capital is Rs 180 a ton

It is on these data that our recommendations are based, but before stating them we desire in this chapter to explain our attitude on certain general questions which necessarily affect our proposals These are the principle of discriminating protection, the extent to which protection should be given by means of bounties or subsidies, the advantages and disadvantages of specific and *ad valorem* duties, the period which our recommendations cover, and finally the special circumstances affecting the Tata Iron and Steel Company and the extent to which they should be taken into account in the protective scheme

Discriminating protection

98 We referred very briefly in Chapter III to the policy of discriminating protection and to one of its corollaries, but the point requires some slight amplification The phrase was defined by the Fiscal Commission in the sense that the temporary sacrifice which even the most successful protection must entail, should be restricted to the minimum necessary to attain the object aimed at This principle as we understand it operates in three ways —

(1) It governs the selection of the industries to be protected,

(2) It limits the amount of the protection to be granted, and

(3) Within each industry it excludes from the protective scheme those products which are not made and are not likely to be made in India

All these aspects are important, but it is the third which chiefly concerns us here Throughout our enquiry we have had the question before us, and we have endeavoured to frame our proposals so as to avoid interfering with products which will continue to be imported because there is no one in India to make them This excludes from the scope of our recommendations most classes of machinery and, with one or two exceptions, everything classed as hardware Within the iron and steel schedule it rules out several items of which the most important are tram rails, hoops and strips and all pipes and tubes except those built up and rivetted from steel plates Finally, within each group of articles it renders it necessary to leave untouched, as far as possible, those qualities of steel (*e g*, high tensile and special alloy steel) which no firm in India has yet made, nor is likely to make for a number of years Minute discrimination is not always possible, but to the best of our ability we have formulated our proposals in accordance with the principle laid down

Protection by means of bounties or subsidies

99 The steel industry is a basic industry and, if its price be raised by the imposition of protective duties, the effect on other industries must be far reaching For this reason the Fiscal Commission pointed out that the best means of assisting a basic industry may often be found by means of a bounty rather than by a protective duty We fully recognize that the protection of basic industries by means of bounties has certain obvious advantages, but we fear that for financial reasons any scheme which proposed to accord protection to steel solely by this means must be dismissed as impracticable at present and we need not dwell on the point further We have, however considered whether a scheme could be devised of a combination of tariff duties and bounties so as to restrict as far as possible the burden on the consumer To a limited extent we have

had recourse to this expedient, but for practical reasons it is impossible to give full effect to it During the next years the production of steel at Jamshedpur will increase from 126,000 to 420,000 tons, and this must entail a very serious reduction in the revenue at present derived from customs duties on steel Any scheme of balancing duties against bounties is in danger of breaking down because the extra revenue from which the bounties are to be paid is a vanishing quantity which ultimately disappears altogether We do not consider it possible to go further in this direction than we propose to go (see paragraph 116 below)

Specific and *ad valorem* duties

100 We do not propose to discuss at any length the relative merits of specific and *ad valorem* duties The experience of other countries seems to show that, with the gradual development of the protective scheme, the specific duty plays a larger and larger part in the tariff When the object in view is the raising of revenue it is natural to assess the contribution levied on imports according to the value of the goods But when protection and not revenue is the goal, *ad valorem* duties have a serious defect especially when prices are subject to wide fluctuations When prices are high and protection is least needed the customs duties are highest, while when prices are low and the need for protection is greatest the duties are also low For this reason we have proposed specific duties wherever possible It may be necessary, however, for special reasons, to make an exception in the case of fabricated steel

Limitation of the Board's proposals to a period of three years

101 We have based our proposals on an average selling price of Rs 180 a ton for raw steel It is impossible however, on that basis to make recommendations intended to remain in force over a long period, for we believe that in three or four years time it will be possible to reduce the cost of steel production in India to a level at which the manufacturer will be able to sell steel at a price much below Rs 180 a ton and still make a reasonable profit We recognise that there are grave disadvantages in a scheme of protection limited in this way We have had it in evidence that if a new firm were to undertake the manufacture of steel, a period of five years would probably elapse before steel was actually produced One of the objects protection is intended to secure is to produce internal competition behind the tariff wall and if the protective duties are subject to frequent revision the prospect of the establishment of new steel works is diminished In spite of this obvious objection however, we are compelled to limit our recommendations to a period of three years We have to deal with conditions as they are and not as we should

like them to be. All our proposals imply some estimate of future world prices for steel and of future manufacturing costs. These estimates are made at a time when prices are subject to wide fluctuations under influences both political and economic, and when the cost of steel making in India will depend on the result of using a process of manufacture which has not yet been tried in the country. In these circumstances long views are impossible, and we believe it will be necessary to hold a fresh enquiry in 1926-27, when the new plant at Jamshedpur has been working for two complete years. By that time world conditions may be more stable and the general level of prices may have settled down. It will then be possible to deal with production costs in the new plant on the basis of ascertained facts instead of the estimates and conjectures which have had to serve our purpose. Meanwhile, even though the rate of protection cannot be assured for more than a short period, it is at any rate possible to lay down the policy definitely, and it is for this reason that we laid stress on the point in Chapter III.

Difficulties created by the fact that rolled steel is manufactured by only one firm in India.

102. We turn now to the special circumstances affecting the Tata Iron and Steel Company. Throughout our enquiry we have been conscious of the difficulty created by the fact that there is only one firm in India manufacturing rolled steel. Inevitably we have had to concentrate our attention on the affairs of one company, but we have not been insensible to the necessity of a wider outlook. Our estimate of the capital expenditure on which the sale of iron and steel must provide a fair return, if the industry is to flourish, and on which the allowance for depreciation must be calculated, is not the actual expenditure of the Tata Iron and Steel Company, but the expenditure which, to the best of our judgment on the data available, any manufacturer of iron and steel on the same scale would have to incur. Similarly our estimate of the working capital required is essentially a calculation of the extent to which a manufacturer of iron and steel under Indian conditions must incur expenditure in anticipation of receiving the price of his finished goods. In respect of the works costs the only Indian data available are the actual costs at Jamshedpur and there can be no other for at least five years to come. It was necessary for the purposes of our enquiry that we should consider whether costs had been raised to an unjustifiable level by failures on the part of the technical management but no facts have been brought to our notice which would justify us in making a criticism of that kind. The Jamshedpur plant compares unfavourably with many plants in western countries in two respects—(*a*) the comparatively low outturn of the steel furnaces, and (*b*) the imperfect

[illegible] the surplus stock. But we are not entitled to say, [illegible] larger output of steel ingots could have [illegible] in the last four years without sacrifice of the quality [illegible] was of little importance when the works were [illegible] to the low cost of coal and even at the [illegible] were projected (1916-17) coal was landed [illegible] Recession. The question of fuel economy has [illegible] but we have had cause to dwell on it rather because of [illegible] future than its bearing on the past.

101. The most important criticisms of the Company which have come to our notice relate not to the technical management of Jamshedpur but to the financial administration of its affairs for which the Bombay office is responsible. The principal example has been taken to the twenty-five year contracts for the purchase of coal which the Company has made with the principal railways. These contracts provide that the price shall be the same as or higher by eight annas a ton than the price paid by the Railway Board. The result is that in the current year and almost certainly in 1924-25 the Company are paying more than the market price for the coal they buy. It does not follow however that the contracts were ill-judged. There may be room for doubt whether it was necessary or expedient to make contracts for so long a period as 25 years or for so large a quantity as three-quarters of a million tons of coal. But since the Railway Board is by far the largest purchaser of coal in the market any firm which can secure supplies at or about the price which the Board is paying should have a reasonable assurance that the price will be below and not above the ordinary level. These expectations have been falsified recently owing to causes which could not be foreseen but when the three-year contracts made by the Board expire the Company will no doubt again secure its coal at a reasonable price.

102. The contracts made with the Railway Board and with certain Railway Companies stand on a different footing. The earliest is the contract with the Bengal Nagpur Railway Company which was negotiated in 1915. Next in order are the contracts with what are known as the Palmer* Railway Companies which were made in 1918 while the contract with the Railway Board which is latest in date was made in 1919. All the contracts took effect

* The Bengal-Nagpur and Central India Railways, the Madras and Southern Mahratta Railway, the Nizam's Guaranteed State Railways, the Bengal and North-Western Railway, the Burma Railways and the Assam Railways and Trading Company.

from 1st April 1920, and then duration and the prices fixed are shown in the following statement —

Name of Railway Administration	Duration of contract	Prices fixed per ton	Rs
Bengal Nagpur Railway	5 years till 31st March 1925	Rails Fishplates	110 140
Palmer Railways	6 years till 31st March 1926	Rails Fishplates	122 8 152 8
Railway Board	7 years till 31st March 1927	Rails Fishplates	130 160

The prices actually received from the Railway Board were never so low as those fixed by the contract By special arrangement the Company received, up to the 30th September 1921, a certain percentage of the difference between the contract price and the market price in England, and from the 1st October 1921 onwards, by arrangements renewed from time to time, the price has been fixed at Rs 156 a ton The Company has furnished us with a statement explaining fully the reasons why they considered it desirable to make certain of the sale of their staple product for a period of years after the war and how the prices were fixed We do not propose to discuss these explanations at length Events have proved that the Company was wrong in its judgment both as to the price likely to be obtained for rails in the open market and the cost at which it could manufacture Similar errors in judgment were frequent both during and after the war, and ordinarily bargains which prove unprofitable furnish no ground for State assistance to the party who has suffered But in this case Government is itself the proprietor of nearly all the Railways with which the contracts were made, and in so far as the contracts have entailed loss to the Company, they have at any rate secured a very substantial gain to the tax-payer * We do not think this fact can be ignored, once it is decided that the steel industry should be protected

Financial difficulties of the Tata Iron and Steel Company

105 During the last three years the Tata Iron and Steel Company has had to face very serious difficulties The time occupied in the construction of the Greater Extensions has exceeded the original estimate by three or four years and the cost

* The Tata Iron and Steel Company estimate that the total saving to the Railways from these contracts in the two years 1920 21 and 1921 22 was Rs 142 lakhs This estimate assumes that but for the contracts, the Railways would have had to pay for imported rails and fishplates the prices quoted in the trade papers In fact, however, rails can always be purchased for export in large quantities at prices substantially below the trade paper quotations If a deduction of Rs 20 per ton be made from the quoted prices on this account and if 90 per cent of the savings on the Company-owned lines is taken as the Government share the net saving to the tax-payer for the two years is Rs 103 lakhs Further savings have also accrued in the last two years, but owing to the low price of imported rails these are much smaller

of the scheme has also proved much higher than was at first expected One result has been that the Company had to face the great fall in prices in 1921 without being able to utilize the new and more economical plant which was being installed Another consequence is that the share capital originally raised to meet the cost of the extensions proved inadequate, and the Company has laboured under the necessity of raising fresh capital otherwise in order to complete the new works In these circumstances the financial resources of the Company have been severely strained In some of the evidence we have received, these financial difficulties have been referred to as if the supposed need for protection was created solely by them, and it has been argued either that the situation could be met by a reconstruction of the Company with a reduced capital, or that if State assistance is given, it should take the form of a loan or guarantee In view of these criticisms it is important that we should make our position clear In our judgment, the need for protection does not arise from any question of finance, but from the difference between the price at which steel is imported and the price at which the Indian manufacturer can sell The main reason for the wide difference between these two prices is the present high cost of production in India This is undoubtedly due in part to the delay in bringing the new plant into operation, but it is not due at all to the difficulty in raising capital It is for this reason that we do not propose to examine the validity of the criticisms frequently made regarding the high dividends paid by the Company in certain years It is obvious of course that, if dividends had been restricted, the Company's financial position would have been easier, and less outside capital would have been required But the need for protection would have been exactly what it is to-day The extra loans which the Company has had to raise do not enter at all into the cost of production as we have determined it

106 It is desirable that we should indicate to what extent, in our opinion, the special circumstances affecting the Tata Iron and Steel Company may justifiably be taken into account in the proposals we are about to make In the first place, we think that account must be taken of the present high level of costs and the fact that the economical production which the new plant ought to give will be attained only gradually In so far as the present high costs are due to the price of coal, allowance should be made because any manufacturer of iron and steel was likely to be affected in the same way The Indian Iron and Steel Company has made precisely similar contracts for the supply of the coking coal required for its blast

Extent to which special circumstances affecting the Tata Iron and Steel Company have affected our proposals

furnaces and Mr. Tarlton (of Messrs Bird and Company) giving evidence for the United Steel Corporation of Asia expressed the opinion that on the average a contract of this kind was likely to result in favourable prices In so far again, as higher costs during the transition period are due to difficulties in working an unfamiliar process of steel manufacture, the same difficulties would affect any firm commencing to manufacture steel in India, and even to a greater degree Finally, since the object of protection is to preserve and develop the steel industry the measures taken must be adequate for their purpose, and must do justice to the facts of the case Whatever reasons may exist for withholding protection altogether there are none for any scheme which at once raises prices to the consumer and at the same time fails to preserve the industry The general principle which underlies our recommendations, therefore, is that the assistance granted should suffice to give the Company—

(*a*) when they reach their full production a fair return on their capital outlay after meeting all overhead charges, provided the works expenditure is reduced to a reasonable figure, and

(*b*) the minimum of assistance required to tide the industry over a difficult period

It is in the light of these considerations that we have taken Rs 180 a ton as the basic selling price for the manufacturer.

Special treatment required for rails

107 In the second place we think that the form of our proposals may rightly be affected by the special position as regards rails So long as the Company is bound under contract to supply rails at a certain price the imposition of a tariff duty must be largely nugatory. The object of protective duties is to secure a fair price to the producer and it is quite useless to raise prices to the consumer if the manufacturer is no better off than before It has already been pointed out moreover that the tax-payer as the ultimate proprietor of the Railways, benefits directly from the contracts. and if the Legislature representing the tax-payer, decides that it is expedient in the public interest that the manufacturer should receive a higher price it seems natural to adopt the most direct method of securing that result The circumstances clearly point, therefore to the advisability of dealing with rails by way of bounties rather than by way of tariff duties

The burden on other industries and on the consumer

108 One very serious question remains for consideration namely the burden which protection for steel is likely to entail on other industries and on the consumer But it is clearly more convenient to defer its discussion until we have explained our proposals for a purely hypothetical discussion is likely to be infructuous

CHAPTER VIII.

Recommendations regarding the protection of the steel industry.

Scope of the Board's recommendations

109 We shall now state and explain the proposals which we recommend to the Government of India for adoption In this Report we shall deal primarily with what may be called raw steel, *i e*, the products manufactured by the Tata Iron and Steel Company Of these the principal are—

Structural shapes, *i.e*, beams, angles, channels, etc

Plates, ship, tank and bridge

Bars and rods, common

Sheets, black and galvanised, whether corrugated or plain

Rails and fishplates

The consequential effect of our proposals on the engineering industry and on the use of wrought iron will also be briefly discussed But our recommendations regarding what may be called the subsidiary industries (tinplate, enamel ware, agricultural implements, etc), must be reserved for the Second Report which we hope to submit at a very early date In the proposals now made we have aimed at securing to the manufacturer an average price of Rs 180 a ton, but in one or two cases we have gone slightly above or below this figure Sheets, whether galvanised or plain stand on a different footing and have been dealt with specially

Structural shapes

110 *Structural shapes (that is, beams, angles, channels, etc, unfabricated)*—The average price at which steel of this kind is likely to enter India without duty is Rs 145 a ton and the present tariff valuation is Rs 150 a ton for angles and Rs 170 for channels (a figure which seems to us excessive) Other shapes are assessed *ad valorem*, the rate of duty being 10 per cent in all cases The present duty may be taken as Rs 15 a ton on the average We propose a specific duty of Rs 30 a ton, which is equivalent approximately to a 20 per cent duty A somewhat higher duty of Rs 35 a ton would be required in order to raise the selling price to Rs 180 a ton but we have preferred in this case

to take a slightly lower figure It is through the price of structural steel that the engineering industries and the Railways are most likely to be affected, and we are anxious that the burden on them should be lightened as far as possible We have taken into account also the fact that our proposals about rails (see paragraph 116 below) will, at any rate in the first year, give the manufacturer rather more than Rs 180 a ton Steel angles and channels are assessed in the tariff schedule separately from wrought iron, all beams are entered in the 'iron or steel' section of the present schedule

Plates

111 *Plates* —The price at which ship, tank and bridge plates are likely to enter India without duty is Rs 150 a ton and the present tariff valuation is Rs 150 We propose a specific duty of Rs 30 a ton on plates of this kind Boiler firebox and special quality plates will remain subject to the present tariff, but as their valuation is Rs 300, all plates will in effect pay the same duty of Rs 30 a ton Wrought iron plates are not in common use and such as are imported are nearly all of special qualities The cost of manufacturing plates at Jamshedpur has hitherto been a good deal above the corresponding cost of rails and bars We have taken no account of that fact, however, for the plate mill has not hitherto been worked to anything like capacity

Bars and rods

112 *Bars and rods* —The price at which ordinary steel bars and rods are likely to enter India without duty is Rs 140 a ton, and the present tariff valuation of common bars is Rs 135 or Rs 150 a ton according to size The present duty is therefore Rs 13-8 or Rs 15 a ton We propose a specific duty of Rs 40 a ton, the incidence being from 27 to 30 per cent This proposal does not affect Swedish bar, and similar qualities, bars made of crucible or high tensile steel or bars which are galvanised, tinned, planished, polished or lead-coated These remain subject to the existing duties, and wrought iron bars are in a separate part of the schedule The specific duty of Rs 40 a ton is not sufficient to enable the Indian manufacturer to sell his bars at an average price of Rs 180 a ton in competition with Continental bars in all Indian markets We have taken into account, however, the fact that at Jamshedpur bars are manufactured to a standard with which the Continental bar does not always comply, and that they tend rather to compete with bars manufactured in the United Kingdom, the price of which is somewhat higher We have also made allowance for the fact that in some of the up-country markets the Indian manufacturer owing to the favourable rates he can secure for complete wagon loads from the Railway administrations, is in a stronger position to meet competition

Sheets—galvanised and black not yet manufactured in India

113 *Sheets*.—The Tata Iron and Steel Company will manufacture both ordinary and black sheets and galvanised sheets. It is entirely uncertain, however, what the cost of manufacture will be, for the Company have not yet set their sheet mills in motion, and are not likely to do so until September 1924. The only evidence we have as to costs is the estimate made by the Company at our request on the basis of 1921-22 coal prices. This estimate puts the works cost of black sheets at Rs. 149 a ton and of galvanised sheets at Rs. 194 a ton. The present tariff valuation of black sheets is Rs. 175 a ton (which is, we think, a low figure), and that of galvanised sheets is Rs. 300 a ton which agrees with the figure at which we arrived. It will be seen that, if the Company can manufacture sheets at figures approaching those they have given, the existing price *plus* ten per cent. duty gives them a *much larger margin above the works cost than they have* in the case of other products. On the other hand, the estimate is for the eventual cost when manufacture has been going on for some time, and the actual cost during the first two or three years of manufacture will unquestionably be higher. We do not think that at the outset the manufacture of sheets can be established in India without protection of some kind. At the same time, in the absence of data as to the cost of manufacture, our proposals must be limited to the lowest amount which has any chance of attaining its object.

Black sheets—proposals

114. The entries regarding sheets, whether galvanised or not, in the present tariff schedule are somewhat complicated. Ungalvanised sheets fall under four entries—

	Tariff Valuation per ton Rs	Present duty Rs
Sheets which have been cold rolled, smoothed (including planished) pickled or cleaned by acid or other material or process	200	20
Sheets black plain	175	17 8
Sheets black, corrugated up to and including 26 Gauge	300	30
Sheets black corrugated above 26 Gauge	400	40

The valuation of the corrugated sheets must be due to some misapprehension, for the corrugation cannot possibly make a difference of anything like Rs. 125 in the value. The average value of black sheets, corrugated and plain, may be taken as Rs. 200 a ton, and we propose that these sheets should be subject to a specific duty of Rs. 30 per ton, which is equivalent to 15 per cent. Sheets falling under the first entry will remain subject to the existing duty. We have not thought it necessary to discriminate wrought iron sheets of which the imports are negligible.

115. The present classification of galvanised sheets for tariff purposes is as follows —

Galvanised sheets—proposals

	Tariff Valuation per ton	Present duty
	Rs	Rs
Corrugated up to and including 26 Gauge	300	30
" above 26 Gauge	400	40
Plain up to and including 26 Gauge	3-0	32
" above 26 Gauge	4-5	42 8

It is not obvious why the plain sheets should be valued more highly than the corrugated We propose a uniform specific duty of Rs 45 a ton for all galvanised sheets This makes practically no difference to the very thin sheets above 26 Gauge, and amounts to about 15 per cent on the thicker sheets which are in common use

116. *Rails and fishplates* —We have already explained (paragraph 107 above), why in our opinion, rails should be treated differently from other steel products The present duty is 10 per cent *ad valorem* for which we think a specific duty of Rs 14 a ton might with advantage be substituted But the additional assistance which the Indian manufacturer requires ought we think to be given in the form of a bounty This is the more desirable because the increase in Railway costs will be very greatly diminished The price at which rails are likely to enter India without duty is Rs 140 a ton which the addition of the duty would raise to Rs 154 We propose that bounties should be given on the manufacture of rails (30 lbs and over) and fishplates for the next three years in accordance with the following sliding scale—

Rails and fishplates

	Rs
1924-25	32 a ton
1925-26	26 "
1926-27	20 "

Save in so far as the Indian manufacturer is bound by long-term contracts the effect would be to give him Rs 187 a ton for rails in the first year Rs 181 in the second and Rs 175 in the third There are two reasons why a sliding scale is desirable In the first place the existing contract with the Bengal Nagpur Railway will terminate in March 1925 the contracts with the "Palmer" Railways in March 1926 and the contract with the Railway Board in March 1927 In each year therefore the manufacturer will receive for the rails he sells a price more nearly equal to the current world price and in the second place costs will fall as production increases For both reasons the need for outside assistance will diminish from year to year The bounty should we propose be

payable only on such rails and fishplates as are passed by the Government Metallurgical Inspector at Jamshedpur who inspects all rails manufactured for the Indian Railways As the Inspector maintains in any case complete records of the quantities of rails passed by him, the determination of the amount payable on account of bounties from time to time presents no difficulties Under these conditions the bounty will not be payable on light rails (under 30 lbs) which are sold principally to private consumers The imported price of these is variable but may be taken at Rs 140 a ton We propose a specific duty of Rs 40 a ton on such rails and on fishplates therefor

Effect of the Board's proposals on the use of wrought iron

117 In the present tariff certain kinds of wrought iron, *viz* — angle, channel, bar and rod—are included in a separate section apart from steel The effect of an increase in the duties on steel may quite possibly be to increase the imports of wrought iron For a number of purposes for which bars and angles are used, wrought iron is as suitable as steel (indeed in some cases preferable), and for many other purposes iron would be accepted as a satisfactory substitute for steel if it were a little cheaper The manufacture of wrought iron in Europe has, we are advised, been affected by post-war conditions even more adversely than that of steel, and plant now lying idle there could quickly be brought into production and supply large additional quantities of iron to India if there were a demand for it Before the war, wrought iron of the commoner kinds was more expensive than steel, but during the last two years the difference in price has been small and there have even been occasions when Belgian iron bars have been quoted at a slightly lower price than Belgian steel bars In these circumstances we see no alternative, if the protection given is to be effective, but to raise the duties on certain kinds of wrought iron, even though it is not produced in India and the ordinary arguments for protection do not apply

Wrought iron bar and rod—proposals

118 The present tariff classification of wrought iron bar and rod is as follows —

	Tariff valuation	Present duty
Bar and Rod—	Rs per ton	Rs
Qualities superior to grade A of the B E S A*		
Grade A of the B E S A and . . .	350	35
Crown quality and intermediate qualities—		
Over ½ inch in diameter or thickness	160	16
½ inch and under	190	19
Common	140	14
Ditto if galvanised, tinned or lead coated .	180	18

* British Engineering Standards Association.

When wrought iron bar of the superior qualities is imported it is nearly always because it is required for a purpose for which steel is not so suitable, and it is not desirable to raise the cost of such bar if this can possibly be avoided. It is common bar which is likely to compete with steel and we propose that a specific duty of Rs. 35 a ton should be imposed on common iron bar and rod (not coated with other metals), the duty on the other qualities to remain as at present. The incidence of the duty will be 25 per cent. on the present valuation. The corresponding duty proposed for common steel bar is Rs. 40 a ton.

Wrought iron angle and channel—proposal.

119. The present tariff classification of wrought iron angle, tee and channel is as follows:—

	Tariff valuation.	Present duty
	Rs.	Rs.
Angle and tee—Crown and superior qualities	200	20
Other kinds . .	160	10
Do. if galvanized tinned or lead coated	200	20
Channel	170	17

Wrought iron angles and channels are not so likely to compete with steel as wrought iron bars. The duty proposed for steel angles and channels is Rs. 30 a ton which is likely to raise the selling price to Rs. 175 a ton and unless the price of wrought iron angles dropped below the present tariff valuation, they would be no cheaper than steel. A comparatively small decrease in the price might, however, lead to increased imports of wrought iron. It will suffice we think if a specific duty of Rs. 20 a ton is imposed on wrought iron angles and tees 'other kinds' (not coated with other metals) and on iron channels. The present tariff valuation of iron channel seems to us high. The superior qualities of angles and those coated with other metals would be left as at present. The effect would be that all iron angles and channels would pay the same duty of Rs. 20 a ton.

Fabricated steel and the Engineering industry.

120. Our recommendations regarding the Engineering industry will be made in our Second Report but we cannot close this Chapter without some allusion to it. The principal raw materials of the industry are cast iron and steel, and the inevitable increase in the price of steel resulting from our proposals must raise the costs of all firms which fabricate steel. From the evidence we have received it is obvious that for the last two years foreign competition in all fabricated steel has been extremely severe, and a substantial increase in costs must be a serious blow to the industry. On that aspect of the case, however, we do not now dwell. Our

immediate object is to point out that the market for certain kinds of steel manufactured in India, *viz*—all structural shapes, plates and to a smaller extent sheets and bars—depends on the existence of the engineering firms No discrimination is ultimately possible between the manufacture of raw steel and its fabrication, for the two are inseparably connected and stand or fall together It would be of little use to protect the manufacture of unfabricated steel, if the result were that the demand for it greatly diminished We are satisfied from the evidence we have taken that, if the proposals made in this chapter are adopted, it will be necessary to raise the duty on fabricated steel to at least 20 per cent and possibly to 25 per cent in some cases We defer our specific recommendations not because we are in any doubt as to their general scope, but because their elaboration and completion would have delayed our Report on the main issue

Payment of Customs Duty by all Government Departments

121 It was our intention to put forward another proposal of a more general kind It was strongly urged by a number of witnesses—particularly by representatives of the engineering firms—that Customs duties should be paid by all Government departments on stores imported by them Under the existing Store Purchase rules, the duty is to be taken into account when the prices of imported goods are compared with the prices of articles produced in India But our attention was called to cases in which the rules had been disregarded or overlooked, and this is not unnatural, for by importing from the Stores Department in England the indenting officer may be able to relieve himself of trouble and responsibility The announcement of the Government of India that the law will be amended so as to necessitate the actual payment of Customs duty on imported stores (with a few specified exceptions) makes it unnecessary for us to submit a recommendation The new procedure will ensure that any extra cost involved by importation will be reflected in the accounts of the spending department, and a powerful influence will come into operation tending to secure observance of the rules The object of protection is to secure the Indian market for the Indian producer, and the Government purchases of iron and steel constitute a large part of the effective demand The evidence given by the engineering firms suggests that more than half their sales of fabricated steel were to Government, to Railways and to other public bodies The point is therefore of importance in connection with the manufacture of steel and it is for this reason that we have referred to it

CHAPTER IX.

Objections to protection for steel and the burden on the consumer.

Scope of this Chapter

122 In the last Chapter we stated and explained our proposals for granting protection to the steel industry, and it remains that we should examine the objections to the grant of protection for steel and the cost to the country of the measures we recommended When we submit our Second Report we shall estimate what the total burden is likely to be and how it is likely to be apportioned as between industries and the consumer generally In this Chapter we shall first explain the point of view from which we have approached the problem and discuss briefly the general objections which have been urged Thereafter we shall deal with the increase in Railway costs, the tariff on machinery and the effect on one important industry of our proposals For this purpose we have selected the jute industry because it is the only one in which some of the data necessary for an exact estimate have been placed before us

The general question of Free Trade and Protection not before the Board

123 One important point must be made clear at the outset The general question of free trade *versus* protection is not in any way within the terms of our reference, and in so far as the objections to protective duties brought before us, whether in written representations or in the oral evidence, merely state the objections to all protective duties, they are beyond our scope and need not be discussed But we are bound of course to consider the special circumstances affecting the steel industry and whether the cost of securing its development is greater than the advantages likely to be obtained The steel industry is a basic industry in the full sense and any increase in the price of steel has far-reaching effects

Principal objections to protection for steel

124 The principal objections to protection for steel which have been placed before us may be briefly stated as follows —

(1) The Indian agriculturist is very poor and a higher price for steel means that the implements of his daily work will cost him more

(2) Protection for steel is contrary to the interests of agriculture, because it will involve a considerable reduction of imports into India and consequently of exports from India, and the foreign market for India's agricultural products will therefore be restricted

(3) The costs of every industry in India will be raised if the price of steel goes up and the effect of a duty on steel is therefore cumulative and far-reaching In particular it would affect profoundly both the Railways and the coal mines and would tend to keep both Railway rates and coal prices at an excessive level

We are indebted to Mr Pilcher of Calcutta for a very full and able discussion of the question from this point of view, and the same arguments in substance were advanced by several commercial bodies, of which we need only mention specially the Bengal Chamber of Commerce

125 The first objection does not require any lengthy discussion

The direct effect upon agriculture of protection for steel

An increase in the duty on steel bars will undoubtedly tend to raise the cost of such steel as the agriculturist ordinarily uses, but that quantity is very small If all the steel bars imported into, or produced in, India were used for no other purpose than to provide the agriculturist with steel, an increase of the duty to 30 per cent would mean an annual burden of about Rs 43 lakhs spread over a population of 300 millions, or much less than one anna a head We agree with the Director of Industries, Bihar and Orissa, that the direct effect of protection for steel on agriculture is negligible, and that the cultivator will be affected, if at all, mainly through any consequential increase in Railway rates that might result, to which we might add the increased cost of bridges in rural areas It would be different if it were intended to impose a protective duty on agricultural implements generally But only one such proposal has come before us and it is of very restricted scope

126 The second objection also need not detain us long

Reduction of imports and exports and restriction of the market for agricultural produce

In so far as the argument is valid at all, it is a general argument against any measure designed to secure the development of industries in India on a large scale and has no special application to steel The development of Indian industries is, we understand, the accepted policy of the Government of India, and in so far as it is successful it must tend to reduce imports, for the time being at any rate, whatever the ultimate effects may be We should stultify ourselves if we admitted that the natural consequences of the policy are arguments against any attempt to carry

it out Mr Pilcher in his oral evidence suggested that the reduction of Indian imports, and consequently of exports, was open to objection—(*a*) because it was produced by artificial means and not the result of natural and healthy development, and (*b*) because it meant the sudden displacement of a large body of imports The answer is that the steel manufacturer has no choice Since large units are essential to cheap production, a policy of slow and imperceptible growth is out of his power The industry must develop by sudden jumps or not at all Quite apart from any question of protection, moreover, the increased Indian production of steel is imminent and the new plant at Jamshedpur is almost ready to operate Unless the manufacture of steel in India is to cease altogether, a heavy reduction in imports is inevitable, since the only chance of cheap production is to utilize the new plant to the full

Effect of protection for steel upon other industries

127 The real difficulty we have to meet is the third, and we fully appreciate its importance Protection for steel must entail some increase in costs to other industries, and we recognise that it is incumbent on us to explore the consequences which must follow the adoption of our proposals But before we discuss some particular aspects of the case, there is one general point to be cleared up

Apprehension regarding future developments of protection for steel

128 The picture of the disastrous consequences of protection for steel, so forcibly presented to us by Mr Pilcher and the Bengal Chamber, owes its most vivid colouring, we think, to an underlying feeling that the real danger is created not by the policy of discriminating protection accepted by the Government of India and the Legislative Assembly but by a policy of indiscriminate protection for all kinds of steel Strong apprehensions were evidently felt that, however the scheme might be limited at the start, the first step would have been taken on a slippery path, and that sooner or later all kinds of steel would be involved in a common fate But this view involves a doubt as to the possibility of adhering to the policy adopted, and we cannot within the terms of our reference discuss it We have been appointed to advise the Government of India by what means and to what extent effect can be given to their policy, and objections to the policy itself are beyond our scope We have to consider the sacrifices which that policy may entail on the community and not the burden which a different policy would bring with it We are not called upon, therefore, to discuss the remoter consequences which protection for steel may bring in its train The case might be different if it seemed probable that the cost of steel production were likely to remain at its present level for a long period of years for existing industries would then have to develop and new industries come into existence on the basis of high steel

costs But we have found good grounds for believing that production costs will fall substantially in the next three or four years, and in that case the burden will be lightened at no very distant date If our expectations are justified, the industries which use steel as their raw material will be gradually built up on the basis of steadily diminishing steel costs This is important because it is the primary cost of raw steel which ultimately determines the level of costs in all the dependent industries

Effect of our proposals on Railway costs—figures for the East Indian and Bengal Nagpur Railway systems

129 We now turn to the effect of our proposals upon the Railways The imposition of protective duties on steel must necessarily involve an increase in Railway expenditure and it is here that the consequences may be most serious It is of great importance to the industrial prosperity of the country that Railway rates should be kept as low as possible, and in so far as protection for steel tends to raise rates or to prevent a reduction which might otherwise have taken place it is open to obvious attack The Railway administrations which supplied us with the most complete information were the East Indian Railway Company and the Bengal Nagpur Railway Company The figures they gave for the increase of expenditure which would result from a 33⅓ per cent duty are as follows —

	East Indian Railway		Bengal Nagpur Railway	
	Capital	Revenue	Capital	Revenue
	Rs lakhs	Rs lakhs	Rs lakhs	Rs lakhs
Rails, fishplates, sleeper	7·96	4·09	12·26	6·57
Steel bridges and girder frames	1·16	3·60	6·8	1·50
Malleable steel	1·26		2·	7·
Structural steel (fabricated)	·05		·96	·8
TOTAL	21·3·	7·69	21·0·	9·84

These figures make it clear that it is through rails and wagons that protection for steel would chiefly affect Railway costs We have proposed (paragraph 116 above) to deal with rails by way of bounty so that there will be no increase of Railway expenditure on that account Our recommendations regarding wagons will be submitted in our Second Report but we may say at once that we shall have no proposal to make for a protective duty on imported wagons When wagons and rails are deducted the balance remaining is not large The East Indian Railway apparently

that the whole of the other steel will be required on capital account which seems an improbable supposition The Bengal Nagpur Railway shows three-quarters of the unfabricated steel and one-third of the fabricated steel under revenue If the requirements of the East Indian Railway are divided in the same proportion the figures for the two Railways together are—

	Capital Rs lakhs	Revenue Rs lakhs
Unfabricated steel	58	1 74
Fabricated steel	5 33	2 06
TOTAL	5 91	1 40

The above figures are based on the difference between a 10 per cent duty and a duty of 33⅓ per cent The increase of expenditure resulting from our proposals will be about one-half the Railway figures in the case of unfabricated steel and two-thirds in the case of fabricated The corrected figures for the increase of expenditure in the two Railway systems will then be—

	Capital Rs lakhs.	Revenue Rs lakhs
Unfabricated steel	29	87
Fabricated steel	3 55	1 77
TOTAL	3 84	2 64

Estimated cost of higher duties on steel to all Indian Railways

130 The total capital outlay on the East Indian Railway and Bengal Nagpur Railway together is nearly a fourth of the total capital expenditure on all the Indian Railways and in 1922-23 they were responsible for about one-fifth of the working expenses of all Railways On this basis the increase in the capital expenditure of all the Railways would be Rs 15 4 lakhs capital and Rs 13 2 lakhs revenue, or about Rs 29 lakhs in all These figures are approximately 0 7 per cent of the capital outlay and 0 2 per cent of the working expenses of all the Indian Railways in 1922-23 It does not seem probable that the Railway rates and fares would be seriously affected by increases of this order of magnitude, and in fact the increase in working expenses would be fully counterbalanced by a reduction of something less than 4 annas a ton in the cost of coal

The tariff on machinery

131 Before we can discuss the effect of protection for steel on Indian industries generally, it is necessary to explain the position as regards machinery The question to what extent the manufacture of machinery in India is likely to be affected by protection for steel is a very important one, but we have found it

The increased cost resulting from our proposals will probably not be more than Rs 100, or about two per cent of the cost of the engine In this case clearly the compensating protection required is not very heavy

The cost of steel in jute machinery

134 The second illustration is taken from jute machinery Three firms manufacturing such machinery came to our notice, of whom two sent us written statements, and we also examined a representative of one of them orally This gentleman (Mr Combe of Fairbairn, Lawson, Combe and Barbour (India), Limited) supplied us at our request with a statement showing the various kinds of iron and steel which his firm required for the manufacture of jute machinery The total quantity required for normal operation is 200 tons a year and the list is as follows —

	Cost c i f Calcutta per ton	Quantities tons
	Rs	
(*i*) Drawing rollers of drawings and rovings (steel)	328	21¼
(*ii*) Drawing and returning roller of spinnings (wrought iron)	245	30½
(*iii*) Faller steel for drawings and rovings	100	41
(*iv*) Spindle steel	595	36
(*v*) Special free cutting steel for studs	227	23¼
(*vi*) Bright drawn bars commercial	Not given	38½

All these items except (*ii*) and (*vi*) are steel of special qualities and as such will not be affected by the specific duty of Rs 40 a ton which we have proposed for common steel bar The wrought iron (item *ii*) is also of a superior quality and will remain subject to the present tariff, while the bright drawn bars (item (*vi*)) fall under the entry in the steel schedule " Bar, galvanised, tinned, planished, polished or lead coated " which we have left unchanged But even if items (*ii*) and (*vi*) had become subject to the specific duties we have proposed for common iron and steel bars, the increase in the firm's annual costs would have been only about Rs 1,600, about 2 per cent of the cost (delivered at works) of all the iron and steel bars used by the firm for the manufacture of jute mill machinery

High proportion of steel in certain kinds of machinery

135 We have thought it worth while to give these illustrations at length, because they bring out the point that detailed enquiries are necessary before the effect of the steel tariff on machinery costs can be ascertained Cases have also come to our notice in which certain articles now classed as machinery will be much more seriously affected by our proposals Thus,

for example the cost of pit-head gears and towers for electric transmission lines—both of them sometimes of fabricated steel—will be referred to the Indian manufacturer to much the same extent as bridgework. Again, common steel bars are used by some of the engineering firms for the manufacture of shafting, and here also cost will go up substantially. But in general, very few cases were brought to our notice where the cost of machinery was likely to be heavily enhanced by an increase in the steel duties.

Tea-garden Machinery

140. In his written statement Mr. Pilcher drew our attention to the manufacture of tea garden machinery in India and remarked that "at least one engineering concern for long associated honourably with the supply of tea manufacturing machinery to the gardens is threatened with heavy loss on its Indian investments in the event of the imposition of a prohibitive tariff on steel." We enquired from Mr. Pilcher, during the course of his oral examination, whether he could give us the name of the firm to which he referred but he explained that he was not at liberty to do so. No representation was in fact made to us by any firm which specialises in the manufacture of tea garden machinery. During the course of our stay in Calcutta we visited the works of Messrs. Marshall, Sons & Company (India) Ltd., an engineering firm which supplies a considerable quantity of machinery to the gardens. This firm did not, however, send us a written representation or request us to take oral evidence. In these circumstances we can only infer that steel is not so important a factor in the cost of tea garden machinery as Mr. Pilcher was led to believe.

Effect of protection for steel on Indian industries generally

137. We should have been glad if it had been possible to examine in detail the effect of increased duties on steel on at least the principal Indian industries. But this could not be done satisfactorily except on the basis of information supplied by the industries themselves, and we have not had the advantage of examining witnesses who were in a position to speak with authority on their behalf. In September 1923 we invited the Indian Mining Association and the Indian Mining Federation to state their views on the general question of protection for steel, but both bodies explained that they were unable to do so. Subsequently, however, the Association sent us copies of the replies received to a circular letter on the subject addressed to its members. The Indian Jute Mills Association sent us a written representation on the 1st December, but explained that they did not wish to nominate any witness for oral examination. Mr. Pilcher assured us in his written statement that there was complete unanimity among the promoters of the

tea industry in resenting a prohibitive duty on steel, but no communication of any kind was received from the Indian Tea Association except on the quite subsidiary topic of the removal of the duty on sulphur Coal, jute and tea are the principal industries in the economic area of which Calcutta is the centre, and the Bengal Chamber of Commerce, which is the natural mouthpiece of the European commercial community in that area, gave emphatic expression to the view that protection for steel would be most detrimental to all of them But unless those who are best acquainted with the facts come forward to state them the materials for a full review of the position do not exist We cannot therefore attempt to deal with the subject in detail It may however be useful to say something regarding the probable effect of our proposals on the jute industry in so far as the data supplied in the letter from the Jute Mills Association and in Mr Pilcher's written statement enable us to do so

Effect of our proposals on the jute industry

138 The effect of our proposals on the cost of jute mill machinery has already been dealt with (paragraph 134 above) and need not be referred to again It is mainly through the duties on structural steel that the industry will be affected Mr Pilcher has given us figures for one important group of mills which show that the original cost of the steel work in the buildings amounts to 8 5 per cent of the total block This figure is in good agreement with another figure arrived at in a different way The Association say that, so far as original construction and equipment is concerned, 75 per cent of the block expenditure is required for constructional steel machinery engines and plant generally Mr Pilcher on the other hand states that the custom in the jute trade is to divide the value of mill block into two shares—one-third of the outlay being assigned to buildings and two-thirds to machinery The inference is that the value of the constructional steel on the average is one-twelfth (8 3 per cent) of the total block On this basis the figures work out as follows—

	Rs	a
Pre-war cost of a new mill per loom	6,000	0
Pre-war cost of constructional steel per loom	500	0
Present cost of constructional steel per loom (50 per cent above pre-war rates)	750	0
Duty on constructional steel per loom at 10 per cent	75	0
Duty on constructional steel per loom at 25 per cent	187	8
Increased cost per loom due to higher duty on steel	112	8

It will be seen that the increased cost per loom is Rs 112-8-0 which is 1¼ per cent of Mr Pilcher's estimate of Rs 9 000 as the total post-war cost per loom and 0 7 per cent of the Association's

[illegible] figure is correct, costs are now
[illegible] lower rates, but whether the planters
[illegible] [illegible] [illegible] due to the cost

[illegible] to the solution of the industry to
[illegible] ten per cent increase in
[illegible] [illegible] and re-
[illegible] construction should, there-
[illegible] fore, given healthy conditions be maintained
[illegible] on that basis
[illegible] on the higher duties on construc-
tion of about Rs 100 lakhs per annum
the increased cost would be about Rs 5 lakhs An industry
which enabled it if every eight years
[illegible] and the more modest estimate
[illegible] in the number of looms operating
[illegible] on the capital side of only Rs 2½
[illegible] to the development of the industry

110 The Indian Jute Mills Association estimate the amount spent by the mills per annum on imports of steel and spare parts made of steel is about Rs 57 lakhs, this figure being calculated on the basis of the actual expenditure on these accounts of several representative mills during the last three years At least half this expenditure must we think be incurred either on articles which are classed as machinery, or on steel of special qualities the duties on which will not be raised The expenditure affected by our proposals may therefore be taken as Rs 28 lakhs of which Rs 2 56 lakhs represents the present 10 per cent duty The new duties at 25 per cent (bars are higher, and structurals, plates and sheets a good deal lower) would amount to Rs 6 10 lakhs and the increase in expenditure is Rs 3 84 lakhs It is possible that the jute mill costs may be raised by the increased price of steel in other ways to which our attention has not been drawn But even if allowance is made for these it does not seem likely that the cost to the industry will be more than Rs 5 lakhs annually As there are 51 jute mills the incidence is about Rs 10,000 a year per mill

General conclusion regarding the burden on industries

111 In the last two paragraphs we have arrived at a figure of Rs 7½ lakhs (Rs 5 lakhs working expense and Rs 2½ lakhs capital) as the additional burden placed on the jute industry by the increase in the duties on steel The data supplied to us do not permit us to carry the calculation further, and it is possible that, if we had had the advantage of investigating the question in oral examination, we might have arrived at a different figure, whether

higher or lower But the estimate of Rs. 7½ lakhs is not an unreasonable one and is of the order we should have expected If it is approximately correct it seems a fair inference that, apart from the engineering firms which are on a totally different footing no one industry is likely to be saddled with an unduly heavy burden In the absence of the necessary data, we cannot calculate the burden on other industries in a similar way and so work up to the total burden upon all the main industries But it is possible to approach the question from the other side The total burden which has to be distributed can be calculated approximately from the Trade Returns, and starting from this end we can work downwards to an estimate of the share falling to the principal industries It is from this point of view that we shall approach the subject in our Second Report The evidence we have obtained suggests generally that about one-third of the burden will fall on the Railways other Government departments and public bodies one-third or something less on the principal industries, and the balance on the minor handicrafts and the general consumer. So far as we can judge the burden will be widely diffused and is not likely to press too heavily on any one section of the community

Probable consequences of cessation of steel manufacture

142 Our general conclusion regarding the cost to the country of protection for steel has been indicated at the end of the last paragraph We have no desire however to minimize the consequences of what we have proposed Protection for steel involves a real burden on the community and a temporary sacrifice in order to secure advantages in the future If we did not believe that the sacrifice was temporary and the advantages more than commensurate we should have had no proposals to lay before the Government of India In so far as these advantages lie in the future there is no need that we should dilate upon them here. They arise naturally from the firm establishment of a great industry which is essential to national security and for which India possesses great natural resources But it is worth while to consider briefly what the consequences would be if protection were withheld and the manufacture of steel in India were to cease A large number of workmen would be thrown out of employment and the industrial training they have gained at Jamshedpur would be to a large extent wasted A very serious blow would also be inflicted on the coal industry owing to the sudden drop in the demand for coal These however are not the most serious results. The development of India's natural resources for steel manufacture would be postponed indefinitely for we have no hope that at the present level of prices fresh capital would be forthcoming or that another firm would enter the business Finally and this is the gravest consequence of all the shock to public confidence in the future of

Indian industries would be extreme It has long been recognised that the progress of industrial development in India will be slow until Indian capital is forthcoming in much more abundant measure than it has been in the pa The complete collapse of the greatest simple industrial enterpris in the country would put back the clock for twenty years at least We do not claim that these considera- tions are decisive But they are factors which must be taken into account in arriving at a decision on a momentous issue

CHAPTER X.

Summary.

143 Before concluding this Report it is desirable that we should summarise the main conclusions at which we have arrived and the proposals we have made

Summary

(1) The Steel industry satisfies the three conditions which the Fiscal Commission considered should be satisfied in ordinary cases by all industries before a claim to protection is entertained It is also an essential industry for purposes of self-defence and of great importance on national grounds It might therefore claim protection even if the ordinary conditions were not fully satisfied

(2) India possesses a great natural advantage for the manufacture of steel owing to the richness and abundance of the iron ore deposits and the comparatively short distance which separates them from the coalfields

(3) The quantities of coking coal available are sufficient for the requirements of the industry for a century or more unless its growth is unexpectedly rapid, and the supplies of limestone and dolomite are ample These materials are not equal in quality to those available in some other countries, but they are good enough for their purpose and are not more expensive than elsewhere

(4) Most of the other raw materials required, and also the materials for refractory bricks, exist in India in sufficient quantities

(5) The Indian market for steel is already large and is likely to grow In respect of labour India is at present at a disadvantage which will be removed as the workers acquire skill and experience

(6) At the present level of world prices steel manufacture in India is carried on at a loss Unless protection is given, there is no hope that it will develop for many years to come, and there is a serious danger that it may cease altogether

(7) India already produces pig iron more cheaply than other countries and the possibility of producing steel of thoroughly sound quality has been proved It has not hitherto been found possible, however, to combine a high output with satisfactory quality As soon as this has been done, the future of the Indian steel industry is assured

(8) It is probable that the cost of steel production in India will fall substantially in the next three or four years, and there is a reasonable assurance that at no very remote date Indian steel will be able to hold its own in competition with imported steel without protection

(9) The need for protection is measured by the difference between two prices—

(a) the price at which steel is likely to be imported into India from abroad, and

(b) the price at which the Indian manufacturer can sell at a reasonable profit

(10) The prices at which steel is likely to enter India without duty have been found to be as follows —

	Per ton.
	1
Bars . .	140
Structural shapes, i.e., angles, beams, channels, etc	145
Rails, 60 lbs. and over . .	140
Plates, ordinary	150
Sheets, black	200
Sheets, galvanized	300

(11) The average price which gives the Indian manufacturer a fair return on his capital has been found to be Rs 180 a ton

(12) Except in the case of sheets, the proposals made for the imposition of duties, or the grant of bounties, approximately bridge the difference between the two prices If, owing to a fall in the price of imported steel, the duties no longer give adequate protection, additional or off-setting duties should be imposed, and the Government of India should take powers by legislation to impose such duties

(13) The operation of the proposals made is limited to a period of three years, both because of the uncertainty as to the future course of world prices, and the probability of a decided drop in the cost of production A fresh enquiry will probably be necessary in 1926-27

(14) The proposals made have been so framed as to interfere as little as possible with those kinds of steel which are not produced in India at present and are not likely to be produced for some time to come

(15) It is proposed that the following specific duties should be imposed —

	Per ton Rs
Steel-	
Structural shapes, i e beams, angles, channels, etc	30
Ship, tank and bridge plates	50
Common merchant bars and rods	10
Light rails (under 30 lbs)	10
Black sheets, whether plain or corrugated	50
Galvanised sheets, whether plain or corrugated	45
Wrought iron—	
Angles, channels	20
Common bars	35

(16) The necessity for imposing tariff duties on certain kinds of wrought iron arises from the fact that the commoner qualities can be used for many purposes for which steel is used, and would displace steel if there were an appreciable difference in the prices

(17) Iron and steel sections of superior qualities remain subject to the present tariff and will not be affected by the new duties proposed

(18) It is proposed to grant bounties on the manufacture of medium and heavy rails and fishplates according to the following scale —

	Per ton Rs
1924 25	32
1925-26	26
1926-27	20

The present *ad valorem* duty would be converted into a specific duty of Rs 14 a ton

(19) The grant of protection to the manufacture of steel must necessarily increase the costs of many branches of the engineering industry at a time when it is holding its own with difficulty in the face of intense competition from abroad The adoption of the proposals made will necessitate an increase in the duty on fabricated steel to at least 20 per cent , and possibly to 25 per cent in some cases

(20) The sacrifice which the country is asked to make in order to preserve the steel industry is temporary and the advantages to be gained are more than commensuate The burden on the consumer is likely to be widely diffused and is not likely to press with undue severity on any one industry, or any one section of the community

G RAINY,
President

P P GINWALA
V G KALE

G C F RAMSDEN,
Secretary

ANNEXURE.

Report by Dr. Fox of the Geological Survey Department, on the Mineral Resources of India for a Domestic Steel Industry.

1 *Letter, dated 12th January 1924 from Dr Pascoe, Director Geological Survey of India to the Tariff Board forwarding Dr Fox's Report*

I have the honour to forward under cover extracts from a report by Dr C S Fox Officiating Superintendent, Geological Survey of India, on The Mineral Resources of India for a Domestic Steel Industry ' I have not been able to check all Dr Fox's figures, but these seem to have been derived mostly from the Mineral Reviews and other publications of my Department With his general views I am in close agreement

2 The subject of the available supplies of coking coal in India is I understand, an important one from the point of view of the Tariff Board Unfortunately, it is not only one on which very little information is available, but is also a question on which it is extremely difficult to make definite statements I will enlarge on these difficulties in the course of my attempt to give you some rough idea of what is known as to the amount of coking coal available in India

3 To begin with the two most important coalfields, Raniganj and Jharia our information of these is of the scantiest It is impossible to make any reliable estimate without being able to correlate the various seams in the fields and this will not be possible until the area has been thoroughly and efficiently surveyed on a large scale The Geological Survey of India have for a long time been fully alive to the necessity of such a survey, and the necessary preliminary topographical survey is now in the process of being carried out on a scale of 4 inches to the mile As soon as sheets of this topographical survey are available a geological examination will be commenced and an endeavour made to correlate the seams and reach some reliable conclusion as to the quantity of coking coal available in the two fields

4 In 1913, Sir Henry Hayden estimated that the reserves of first-class coal at depths up to about 1,000 feet in Raniganj and Jharia totalled something like 1 378 million metric tons The Coalfields Committee in 1920 estimated that the Raniganj field contained 518 million tons of so-called ' first-class coal and that the addition of the Jharia reserves would bring the total for the

two fields up to nearly 1,000 million tons It was thought by the Committee that an appreciable percentage of this might have been destroyed by intrusive igneous rock During the same year in which the Coalfields Committee's report was written, Mr R R Simpson, Chief Inspector of Mines, assuming that it was possible to work coal of a " superior quality " to a depth of 1,500 feet, or to a distance of 10,000 feet from the outcrop, came to the conclusion that the total quantity of superior-quality coal in the Raniganj and Jharia fields totalled something like 1,863 millions of tons, after making an allowance for coal damaged by igneous intrusion Of this reserve Mr Simpson estimated that not more than two-thirds would be suitable for the production of coke Mr Simpson's figures would therefore lead us to the assumption of a reserve of *1,242 million tons of coking coal*

5 How much of this 1,242 million tons it would be possible to use under present economic conditions for metallurgical purposes, it would be difficult to say The question is an economic one The higher the ash-percentage of the coke the less efficient is that coke for metallurgical purposes The ash-percentage of the coke thus affects the cost of production of pig iron and steel Coke with a 20 per cent ash content can, I believe, be used profitably under present conditions in India, but under different economic conditions it would no doubt be possible to utilize coke with a higher ash content It is perhaps worth pointing out that the above-mentioned 1 242 million tons of coking coal falls under the category of superior coal, and it seems therefore justifiable to conclude that the coke derived therefrom would be of a comparatively high grade

6 The next coalfield we may consider is that of Giridih This is a small field, containing a reserve which was estimated by Mr Simpson in 1920 to consist of some 70 million tons of coal yielding a first-class coke Most of the Giridih coal is owned by Government Dr Coggin Brown's recent estimate of the Giridih reserves comes to about *60 million tons*

7 The Bokaro field is said to contain over *600 million tons of coking coal* I have very few reliable figures regarding this field, but the coke, on the whole, is hard and the ash-content somewhat high Owing to the latter fact it is a matter of present dispute as to whether the ' run-of-mine " coal would at present be profitably utilizable for metallurgical purposes or not Recent experiments carried out by Mr W Randall, show that it is possible to clean the " slack " of the principal Bokaro seam, the Kargali seam, and produce a coal yielding a little over 14 per cent of ash and therefore fit for the manufacture of a coke which could be used at the present day for metallurgical purposes The percentage of ' slack ' in an Indian coalfield averages about 13 per cent ,

so that in the Bokaro field there is at least 48 *million tons* of potential 'slack', which, after Froth Flotation treatment would yield a product cheap enough and sufficiently suitable to be used for the preparation of a coke utilizable under present economic conditions for metallurgical purposes By breaking up the "run-of-mine" coal, successive fractions of what we may designate "artificial slack" decreasing slightly in quality, could be obtained In this way it is probable that as much as 30 per cent of the output from the Kargali seam could be used remuneratively under present economic conditions for metallurgical purposes Under changed economic conditions it would no doubt be possible to make use of a large proportion of—perhaps all of—the "run-of-mine" coal for the same purpose The estimate of 600 million tons is probably a conservative one Dr Brown's estimate is *650 million tons* from the Kargali seam alone The other seams in Bokaro are small in comparison and have so far yielded only an inferior grade of coke Taking Dr Brown's figure of 650 million tons as covering any possibilities in these small seams we may assume from the above considerations that by Froth Flotation treatment—which it is claimed can be carried out profitably—there is 195 million tons of coal in Bokaro capable of yielding a coke which could be used under present conditions for metallurgical purposes Under different conditions, probably the whole 650 million tons after being cleaned, could be used

8 So far there have been no reports of the occurrence of coking coal in North Karanpura and this field must be left out of the calculation Of South Karanpura we have very little more information The coal from a very limited number of tests yields a soft coke, but when mixed with a coking coal from Jharia, it is said to have produced a coke superior to the coke produced from the Jharia coal alone The precise significance of this is not understood and it should I think not be concluded that the Karanpura coals are incapable of producing any first grade coke until further experiments have been made It is not far from the Bokaro coal and one would rather expect to find that some of it at least possesses good coking qualities

9 Large reserves of coking coal are known to occur in various parts of Assam but cannot be used for metallurgical purposes until some means have been found to eliminate the large percentage of sulphur (about 3 per cent) The four fields of Makum Namchik Darangiri and Nazira contain over 250 million tons of coal within a few feet of the level of the plains Should some method of removing this sulphur be discovered all this coal would yield a first-class coke with an unusually low ash percentage Such a discovery would at the same time probably make it economically possible to mine below the surface in which case the

amount available may be double or treble the above amount It is unfortunately separated by several large rivers and a considerable distance from the non-fields and smelting works

10 The western parts of the large Sohagpur coalfield have been reported to show no coking coal, but a more recent authority states that part of the coal, which is of good quality, cokes well Some of the coal in the south of the neighbouring Jhilmili field is said to have coking properties

11 The coals of the Central Provinces all seem to be non-coking, and the same may be said regarding Talchir and Singareni, and of the smaller Central India and Bihar fields such as Singrauli, Ramkola, Tatapani, Hutar, Karasia, Korea, etc

12 The figures quoted above regarding quantities of coking coal apply to what have been termed "available supplies" It is impossible to make certain of what is precisely intended by this term and whether it makes any allowance for waste in extraction Mr Trehearne Rees calculated that the proportion of coal recovered from Indian mines averaged about two-thirds of the total quantity present It is probable that no allowance has been made for this in estimating "available supplies", and it will be assumed that one-third of the available supplies will be wasted in extraction The above results may now be tabulated as follows —

A Amount of finally available coal capable of yielding, after cleaning treatment or otherwise, a coke utilizable profitably under present conditions for metallurgical purposes

Raniganj and Jharia	1,242	million tons
Giridih	60	„ „
Bokaro	195	„ „
Other areas, say	50	„ „
	1,547	„ „
Deduct—one-third waste	516	„ „
Total finally available	1,031	„ „

B Amount of finally available coal capable of yielding after treatment or otherwise, a less efficient coke for metallurgical purposes

Raniganj and Jharia	1,242	million tons
Giridih, say	60	„ „
Bokaro	650	„ „
Other areas, say	100	„ „
	2,052	„ „
Deduct—one-third waste	684	„ „
Total finally available	1,368	„ „

To the latter total can be added $\frac{1}{3}$ of say 600 = 400 million tons of Assam coal which would yield a first-class metallurgical coke, provided some means of eliminating the sulphur were discovered and transport difficulties successfully overcome This gives a grand total of *1,768 million tons of coking coal*

13 From the above remarks it will be clearly seen that the amount of available coking coal depends upon the grade of coke required, and the grade of coke depends upon economic factors, such as the market price of pig-iron, protective duties, etc The supplies may also be increased by judicious mixing I need hardly point out that the figures quoted in this letter are nearly all rough approximations only, and may be half or double the true amounts My opinion is, however, that a deficiency in one figure may be to a greater or less extent balanced by an excess in another, and that the totals are, if anything, on the conservative side The Raniganj and Jharia estimate may, for instance, be too large, but the Bokaro estimate and the *nil* figure for Karanpura are more likely to be too small I think it is safe to conclude that, assuming 3 tons of coking coal to be necessary to produce $2\frac{1}{4}$ tons of coke, there is enough coking coal in India to supply the iron and steel industry with 4 million tons of metallurgical coke per annum for the next 150 years at least

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2 *Report by Dr For*

on the Mineral Resources of India for a Domestic Steel Industry

I have found it most convenient to discuss the various mineral substances—so-called raw materials under the following heads —

1 Iron Ore
2 Coking Coal
3 Fluxes
4 Modifying Metals
5 Refractory Materials

I Iron Ore

It has long been known that India possessed valuable deposits of iron ore, but exactly how valuable has only recently been proved In consequence of investigations within the last twenty years it has been shown that India possesses extremely valuable deposits of high grade iron ore which had not previously been included in the estimates of the world's reserves Already the names

Mayurbhanj, Bonai and Keonjhar are familiar in industrial circles and, in India better known than the occurrences of Lorraine Mesabi and Wabana The chief types of iron ore in India which have attracted attention are magnetites laterites clay iron stones and hematite Hematite enters into the composition of the other three types and is in itself the most important class of ore now being worked in India I propose to discuss them in the order named

Magnetite —The largest deposits of magnetite estimated in thousands of millions of tons (see paper by Aloke Bose in the Journal of the Iron and Steel Institute Vol LXXXXIX 1914 pages 528-542) occur in the Salem district of Madras but the scarcity of fuel makes it impossible to work the deposits on a large scale The principal occurrences are those of (1) Godamalai where the main bed has an average thickness of between 50 and 100 feet and forms precipices several hundred feet high (brochure on Iron Ore Imperial Mineral Resources Bureau) (2) Thalaimalai-Kolmalai (3) Singapatti and Singapuram (4) Thuttamalai and (5) Kanjamalai where the two lowest beds measure 50 and nearly 100 feet respectively in thickness The total quantity of ore available is considered to be practically inexhaustible" Other valuable deposits occur in the Nellore district and elsewhere in the Madras Presidency

Laterite —These ores which are normally hydrated oxide of iron frequently limonitic and often hematitic, nearly always contain appreciable amounts of alumina (primary laterite) or silica (as quartz in detrital laterite) It is difficult to give an adequate idea of the enormous quantities of this class of ore in India The laterite ores are of low grade and not particularly attractive.

Clay Ironstone —These ores are invariably found interbedded among the coal-bearing strata of the Indian coalfields They seldom prove to be carbonate ores and although 'blackband' ironstone often occurs, the ore is distinctly hematitic in character The best known occurrence of Clay Ironstone in India is that of the Ironstone shale beds in the Ramganj Coalfield where it occurs as a stage between the Barkar and Ramganj beds The ore used in the Barakar Iron Works at Kulti during 1889-1905 contained as much as 46 per cent Fe (iron) The analysis quoted being —65 to 66 per cent ferric oxide over 2 5 per cent manganese oxide, up to 2 per cent lime and magnesia from 5 to 9 per cent alumina 10 to 13 per cent silica 10 to 12 per cent combined water 09 to 44 per cent phosphorus and a trace of sulphur Since 1914 those iron works have discontinued using clay-ironstone ore and obtain their ore supplies from the hematite deposits of Kolhan (Singhbhum) near Manharpur Occurrences of clay-ironstone are known in the coalfields of Upper Assam, of Auranga

(Bihar and Orissa), and elsewhere but it is unlikely these ores will be worked until the hematite deposits of Singhbhum and Orissa are exhausted

Hematite—Perhaps the most valuable iron ores in India at the present time are the hematite ores of Singhbhum and Orissa in what is known as the 'Iron Belt' This tract extends from the deposits of Gurumaishini in Mayurbhanj State westwards through the Keonjhar and Bonai areas to the Subdivision of Kolhan in Singhbhum Both in quality and quantity these ores are thought to exceed any other ores of the same kind, including the great American occurrences of Minnesota, Wisconsin and Michigan

Quality

The quality of the 'Iron Belt' ores can be gauged from the following analysis —64 0 per cent Fe (iron), 0 05 per cent manganese dioxide, 2 1 per cent silica, 0 05 per cent phosphorus, 0 002 per cent sulphur, 0 15 per cent lime, 0 18 per cent magnesia and 1 25 per cent alumina The above represents a bulk lot, sampled from the workings of the Bengal Iron Company (Barakar Iron Works) of Kulti at their mines on Pansira and Buda Burn Hills near Manharpur on the Bengal Nagpur Railway In analyses of ore from other deposits in the 'Iron Belt' the iron content often ranges up to 68 per cent Apart from their high metal percentage these ores are notable for their low sulphur total which is never more than 0 6 per cent The phosphorus percentage varies but averages 0 08 per cent Manganese also varies—rarely more than 1 per cent in the steely ores it may equal the iron content in certain porous ores

Reserves

Recent estimates of the hematites of the 'Iron Belt' as given by Mr H C Jones of the Geological Survey of India are for ores containing not less than 60 per cent Fe (iron) as follows —

Singhbhum District	1,074 million tons	
Keonjhar State	806	,, ,,
Bonai State	656	,
Bonai or Keonjhar	230	,, ,,
Mayurbhanj State	16	,, ,
Total "Iron Belt"	2,832	,

Mr E Parsons calculated that the proved quantity of 60 per cent ore in the same area was not less than 3,000 million tons while Mr C P Perin goes so far as to say that in the quadrangle 400 miles east to west by 200 miles north to south (with Calcutta at the north east corner) there are 20,000 million tons of high grade ore at an average distance of 125 miles from the Bengal coalfields It is thus seen that these ores alone will be more than sufficient for

the requirements of the Indian ironmasters of 1928 for 1 000 years at the projected output of 1 500.000 tons of pig iron annually

Other Hematites.—In addition to the great hematite deposits of the Iron Belt there are also other valuable occurrences which call for mention—particularly those of the Central Provinces Mysore and Kumaon

The occurrences of Lohara and Pipalgaon in the Chanda district and the deposits of Rajhara (Dondi-lohara) in the Drug district are said to be the most important hematite ores of the Central Provinces. The Chanda ores average 61 to 67 per cent Fe (iron). 1·5 to 11·04 per cent. silica 0·012 per cent sulphur and 0·005 per cent. phosphorus The Lohara deposit constitutes a hill 600 yards long. 200 yards wide and 120 feet high and has been traced for 2½ miles An unsuccessful attempt was made in 1875 to smelt these ores at Warora. There is a large coalfield in the Chanda district and limestone of good quality occurs in the vicinity of Kandara and Karamgohan. In the Drug district the Rajhara ores are said to average 66 per cent Fe (iron) 0·058 per cent phosphorus 0·108 per cent sulphur. 1·44 per cent silica 0·151 per cent manganese and the estimated reserves are computed at 10 million tons There is good quality limestone at Dalli but the only local fuel is charcoal. The fuel question confronts any project for erecting iron works in the Central Provinces because the coals in that region are non-coking and high in ash It is possible that electric smelting may some day be found profitable in which case the occurrences of manganese ores in the Chhindwara Nagpur and Balaghat districts may be used in the production of ferro-manganese.

There are several important deposits of iron ore mixed hematite and magnetite in Mysore State Of these the most attractive are those of the Bababudan hills where 25 to 50 million tons of hematite of 60 per cent quality have been located The recently established Mysore Wood Distillation and Iron Company have erected iron works for the production of charcoal pig iron and they have in mind the electrical heating of their furnaces should the fuel question become acute in the event of an expansion in the output

Two attempts in 1857 and 1877 were made to establish iron works in Kumaon near Naini Tal (United Provinces) but the operations proved unsuccessful chiefly due to lack of fuel. The only local fuel is charcoal any coke would have to be brought from the Bengal coalfields To this day we have no precise information regarding the quantities of iron ore at Ramgurh and Dechauri The former is a siliceous ore carrying 42 to 60 per cent. iron while the latter, a soft hematite averaging 30 to 55 per cent iron is aluminous

Indian Iron Ores

Type	Deposits	Reserves	Composition			Remarks
			Fe	P	S	
Magnetite	Cuddalmalai and Kanjamalai, Salem, Madras	Estimated in thousands of millions of tons Vo percentage figures	Per cent 55	Per cent	Per cent 0 028	Sand to be unsuitable for use in blast furnaces All coke must be imported from Bengal fields
Laterite	Mallarpur, Raigmahal Hills (Bengal) Kanhiwara Hills, Jubalpur (C P)	Large, unknown		0 3 to 0 62		Centre of old native industry of Barbhum
Clay Iron stone	Ramgunj Coalfield (Hazaribagh)	49 million tons	43	$1\cdot5\ P_2O_5$		Suitable for blast furnaces
		At least 400 million tons	53	0 146	0 02	Lack of fuel
Haematite	Mayurbhum		38 to 46	0 09 to 0 44	trace	2 5 per cent manganese oxide, up to 2 per cent lime and magnesia, 5 to 9 per cent alumina, 10 to 12 per cent silica, 10 to 12 per cent combined water Used till 1913 in Barakar Iron works at Kulti
	Bonai and Keonjhar	10 million tons				
	Bonai	280 " "				
	Singhbhum	656 " "	60 to 68	0 03	trace to 0 6	Average Kolhan Ore 64 per cent Iron, 0 05 per cent Manganese Dioxide, 2 1 per cent silica, 0 07 per cent phosphorus, 0 02 per cent phosphorus, 0 15 per cent sulphur, 0 18 per cent magnesia, 7 25 per cent alumina.
	Keonjhar	1,074 " "				
		903 " "				
	Total "Iron Belt" (Singhbhum and Orissa)	2,872 " "				

Indian Iron Ores—concld

Type	Deposits	Reserves	Composition			Remarks
			Fe	P	S	
Hematite—concld	Singhbhum and Orissa	2,832 million tons	Per cent 60 to 68	Per cent 0 08	Per cent trace to 0 6	These ores lie within 150 miles of the coalfields with coking coal capable of giving metallurgical coke
	Lohara Chanda (C P)	100 „ „ at least	61 to 67	0 005	0 012	Pipalgaon deposit not included Local limestone good Wardha Valley coal does not coke, operations in 1875 unsuccessful
	Rajhara (Dondilohara) Drug (C P)	10 „ „ estimated	66	058	0 108	Limestone at Dalli Coke must be imported Held by Tata Iron and Steel Company
	Bababudan Hills, Mysore State	25 to 60 million tons	42 to 64 5	C 044 to 0 105	trace	Ironworks erected 1922 using charcoal for production of pig iron
	Ramgarh and Dechauri, Kumaon (U P)	Not known	43 to 60 and 39 to 55 respectively.	Not known		Ramgarh ore siliceous, Dechauri ore aluminous Attempts in 1857 and 1877 failed through lack of fuel No local coal

2 Coking Coal

Want of success in Indian iron works in the past was almost entirely due to lack of sufficient suitable fuel The Barakar Iron Works is the only relatively old established enterprise which has succeeded, and owes its success to the discovery of seams of coking coal of fair quality in its vicinity The future of the Indian iron and steel industry pivots on the reserves of coking coal available in the Indian coalfields Doubts have been expressed as to the sufficiency of coking coal for a large domestic iron and steel industry It has been previously stated that the output of pig iron in India in 1928 may attain 1,500,000 tons annually and would require roughly 2,250,000 tons of Indian coke necessitating the expenditure of nearly 3 million tons of coking coal The life of the hematite ore deposits was calculated at 1,000 years at the above output of 1 500,000 tons of pig iron This means that there should be at least 3,000 million tons of coking coal capable of producing a good metallurgical coke This quantity of coking coal would smelt all the known reserves of hematite in the Iron Belt ' of Singhbhum and Orissa at whatever rate of consumption the ore deposits might be used up The estimate of 3,000 million tons of coking coal allows no margin for coal to be used for any other purpose but that of manufacturing coke

The Minority Report of the Coalfields Committee (1920, p 31) says that ' India possesses enormous reserves of good quality coal, both coking and non-coking In place of the 45 years life suggested above, I consider that in the recently proved portions of the Jharia and Raniganj fields and in the Bokaro and Karanpura fields, to say nothing of those fields lying still further to the west, we have at least 300 years supply of good quality fuel available '

The Majority Report of the Coalfields Committee (1920) speak of the life of the fields as 45 years and they say that " it has been calculated that the Raniganj coalfield alone contains over twenty thousand million tons of coal of all kinds, most of this, however, is inferior, and only 518 million tons have been estimated to be of better, or so-called ' first class " quality The addition of the Jharia reserves of higher grade coal would bring the estimates of the two fields up to nearly a thousand million tons, but this figure may need modification in view of the large quantities of coal now known to have been destroyed in both fields by intrusive igneous rocks Further to the west the Bokaro field is said to contain over six hundred million tons of coking coal and it is possible that further reserves will be found in the Karanpura field Apart from these the only " other coking coal known to occur in any quantity in India is that of Assam the high sulphur content of which, however renders it unfit for metallurgical purposes So far as we know

therefore, India will be dependent for her supplies of metallurgical coke on the group of fields lying in the Damuda Valley and including Raniganj and Jharia, and, although the total amount of coal that they contain is undoubtedly very large, the quantity available for coke manufacture is strictly limited ' The above remarks point to an estimate of under 2,000 million tons of coking coal suitable for metallurgical coke and then with some doubt as to whether this is not an over-estimate

I find it impossible to arrive at any exact estimate regarding the reserves of coking coal in India After a careful perusal of the available literature and information on record in the office of the Geological Survey of India the following computations appear trustworthy

Total Reserves of Coal of all Grades—The total Indian resources of coal of all classes and grades which are thought to be both workable and available in the important coalfields of India are —

Giridih	60 million tons
Raniganj	21,000 "
Jharia	20,000 "
Bokaro	1 520 "
Ramgarh	3 "
Karanpura N	8 900 "
Karanpura S	75 "
Aurunga	20 "
Hutar	9 "
Daltonganj	9 "
Rajmahal	210 "
Talchir	44 "
Total Bengal and Bihar and Orissa Coalfields	52,350 "
Makum	90 "
Namchik	90 "
Daringgiri	76 "
Nazira	20 "
Total 4 Assam Coalfields	276 "
Satpura Fields	100 "
Chhattisgarh Region	200 "
Wardha Valley	400 "
Total Central Provinces	700 "

In the above estimates which total less than 54,000 million tons the percentage of good quality coking coal is barely 5 per cent (see details below) but all our estimates are in the nature of guesses and it is by no means certain if all the coal classed as good quality coking coal is really coking coal at all

Reserves of Good Quality Coking Coal —In the absence of large scale maps of the various coalfields and in the almost entire lack of complete analyses of Indian coals, it is quite impossible to arrive at a reliable estimate of the quantities of coking coal The following figures give an idea of the order of the reserves thought by several competent investigators to exist in the chief coalfields —

Giridih	45 million tons		
Ramgunj	875	„	„
Jharia	400	„	„
Bokaro*	360	„	„
Karanpura†	500	„	„
Total Damuda Valley‡	2,180	„	„
Add—Upper Assam Coalfields	220	„	„
	2,400	„	„

As stated previously, the amount of good quality coking coal necessary to smelt the iron ores of Singhbhum and Orissa should equal 3,000 million tons, whereas by doubtful calculations it appears only possible to locate 2,400 million tons as a total of good quality coal irrespective of its coking or non-coking quality It is thus seen that the quantity of suitable fuel for an extensive iron and steel industry is limited

There is of course an enormous quantity of low grade coal, the estimates exceeding 50,000 million tons, but this material as found is unsuitable for the production of metallurgical coke It is clear that if a very large expansion in the Indian iron and steel industry is to take place the promoters of the projected extensions must keep in mind the strictly limited quantity of coking coal in the Indian coalfields

Quality of Indian Coals —It is, I think, quite generally known that the best Indian coals are inferior to the average British coals The coking coals of India appear to be characteristically high in phosphorus and moderately high in ash judged by European and American standards The phosphorus finds its way into the pig iron—not always to the advantage of the pig iron, although in some cases more phosphorus (as apatite) is added to produce a phosphoric pig suitable for foundries making light castings The percentage of phosphorus in normal Indian pig iron necessitates the use of the relatively more expensive basic process in the production of steel Another disadvantage to the presence of phosphorus in the fuel appears to be that the ferro-manganese obtained from blast furnaces

*This figure is probably considerably too low

†No report of the occurrence of coal yielding a first class coke in Karanpura has yet been received

‡This is close to my own figure but does not allow for waste during extraction

contains more than 0·3 per cent phosphorus—the limit fixed by European makers

Indian coals are geologically younger than the coals of Europe and America In Assam coal occurs in beds of Tertiary age (*Makum* and *Namchik*) and in strata of Cretaceous age (*Daranggiri*) The coal seams of Raniganj, Jharia and most of the Gondwana coal-bearing strata belong to the period homotaxially equivalent to the Permian system The Giridih seams (*Kharharbari*) which are known to produce the best coking coal in India, are of Upper Carboniferous age The Indian coals, above mentioned, are more liable to spontaneous combustion than foreign Carboniferous coals evidently because they suffer oxidation more readily when exposed to the air.

Complete analyses of Indian coals are conspicuous by their absence, but so far as it is practicable to do so I have tabulated a few of the usual types of analyses in the accompanying table Such an arrangement admittedly does not bring out the superior importance of the Raniganj and Jharia coalfields nor does it truly express the composition of individual seams when several occur in the same field An ideal table would give the average analysis of each seam in each field Unfortunately it is not possible to attain this perfection in the attached table

[illegible]

Geological Age	Coalfield	Reserves in Millions of Tons Total all classes	Seam	Composition: Fixed Carbon	Volatile	Ash	H_2O	[illegible]	Remarks
Tertiary	Makum	Tons [illegible]		57 17	[illegible]	2 1		[illegible]	[illegible]
	Namchik	[illegible]							
	Nazira (Assam)	20		[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
				57 8	[illegible]	[illegible]	[illegible]	[illegible]	
Cretaceous	Darangiri (Garo Hills)	76		19 8	20 3	5 1	5 8		
	Umblay River (Khasi Hills)	? Largest field in Khasi Hills		50 10	[illegible] 16	8 6	5 8[illegible]	Some of it cokes	The [illegible] lignites which [illegible] become known when [illegible] They contain [illegible] of [illegible] matter which may help the coking property

Analysis of Indian Coals—concld.

Geological Age	Coalfield	Reserves in Millions of Tons Total all classes	Seam	Composition		Ash	H^4O	P	S.	Coke	Remarks
				Fixed carbon	Volatile matters						
Permian (Gondwana)	Raniganj	Tons 21,000	Upper Raniganj, Lower Raniganj Barakar	49 28	32 30	11 43	6 99			The Sanctoria, and other seams give good coke	The coal in the Raniganj stage is composed of alternate bright and dull layers as in the Barakar seams The coals of the Barakar group vary greatly in character and quality in various fields They all have lamented appearance due to alternating layers of bright and dull coal In general a predominance of bright coal means greater purity and a bituminous quality The seams to vary in thickness and quality within shorter distances nearly all the seams are inferior in quality to average British coal The quantity of sulphur and phosphorus is very variable The average of 31 assays from Raniganj gave—
				52 94	31 76	11 51	3 79	0 088	0 74		
				59 75	25 13	14 0	1 12				
Damuda (Raniganj Barakar Group)	Jharia	20,000	Raniganj Stage	57 26	30 62	10 45	1 68	0 143	0 80	Seams, 14, 15, Bhowra A and 17	
			Barakar group	63 77	23 21	11 78	1 25				
	Bokaro	1,520	Kargali	51 8	25 2	22 3	0 7			Coking quality	
	Karanpura	8,975	Argada				..			Cooking quality	
	Aurunga	20		36 5	29 2	27 5	6 7			Cakes weakly	
	Hutar	9		55 35	28 0	10 7	5 95			Cakes	
	Daltonganj	9		49 37	27 63	14 67	8 4			Cakes weakly	

	Rajmahal	210	Average	12 13	39 50	18 37					Per cent.
	Talchir	11	Main Seam	4 4 8	41 3	8 1	5 8			Non coking	H_2SO_4 0 07
	Koren (C P)	16 (Two fields only)	Kurasia field	59 95	25 59	7 62	6 84				P_2O_5 0 14
	Umaria (Rewa)	55		66 71	19 71	8 12	5 16				
	Satpura	100	Mohpani field (Chindwara)	18 71	24 26	24 01	2 52		0 5	Non coking Alone	
			(Barkui)	46 30	30 13	15 05	8 22				
	Wardha Valley	100	Ballarpur field	15 34	31 09	11 27	12 30		1 0	Non coking	
			Ghugus field	15 61	33 49	20 90					
	Godavari (Hyderabad)	36 (King Seam only)	Singaroni field (King Seam)	56 5	25 25	10 65	7 6				
Upper Carboniferous (Gondwana) Talchir Kharharbari Group	Giridih	60	Upper Kharharbari	60 85	22 51	15 81		0 019	0 62	Excellent coke from Lower Seam	The coal is usually dull coloured and tolerably homogeneous in structure, the layers of every bright jetty coal are few and ill marked The seams are variable in thickness but uniform in composition These coals are said to be different in structure to those of the Damuda Valley
			Lower Kharharbari	66 84	24 42	9 15	1 2				

3. Fluxes

The modern blast furnace process of reducing iron ores involves the use of limestone as a necessary ingredient of the furnace charge This substance calcium carbonate, combines with the impurities in the ore and fuel and forms a molten slag It is unnecessary to say that the limestone should be as pure as possible not less than 90 percentage $CaCo_3$, and uniform in quality In the absence of *True limestones* of high quality it is often necessary to employ types containing appreciable amounts of magnesium carbonate These *Dolomitic limestones* do not produce quite so fusible a slag and consequently involve somewhat higher temperatures in the furnace The presence of a small percentage of carbonate of iron is not considered as an impurity but silica, alumina, phosphorus, and particularly sulphur are impurities which should not exceed certain stipulated amounts *Sulphur* is to be avoided in the furnace charge as it is never a desirable constituent in the metallurgy of iron and steel and invariably has to be removed from the metal by costly treatment Phosphorus is occasionally added to the furnace charge, in the form of the mineral Apatite, in order to produce a particularly fluid cast iron for foundries making light castings *Silica* is often desirable when there is an excess of alumina in the ingredients of the furnace charge, and *vice versa alumina* is permissible if the charge, usually the ore, is too rich in silica The object in employing limestone as a flux is to obtain a calcium aluminium silicate slag of definite composition and calculable melting point

Limestones —Unfortunately most of the large occurrences of rich limestones in India lie at distances exceeding 200 miles from the existing iron works The deposits nearer at hand have proved to be unattractive because of the inferior or irregular quality of the material There is little doubt but that the Indian iron-masters are anxious to procure cheaper limestones of more uniform quality than they now obtain The Barakar Iron works first obtained their supplies locally from Panchet hill and Hansapathar, they then appear to have mixed the local material with limestone from Muhar (Rewa), and now their supplies come exclusively from the Bisra, Rourkela (Gangpur) area Similar changes in source of supply has taken place in the case of the Jamshedpur (Sakchi) ironworks, who first got their limestone from Katni and now operate their own quarries at Panposh (Gangpur) and obtain a dolomitic limestone from rocks of the same age as those of Bisra and Rourkela The limestones of Rohtas (Bihar) although of good quality are not sufficiently attractive in price The best material would appear to be that of Assam but the freight places this material beyond the pockets of the ironworkers of Jamshedpur and Kulti The question of limestone for fluxing purposes requires further investigation

The occurrence between the villages of Devedag and Olherpat on the eastern edge of the Auranga coalfield is recommended for examination to the Indian iron masters

ANNEXURE

Indian Limestones

Locality	Remarks	Composition					Remarks
		$CaCO_3$	$MgCO_3$	Al_2O_3 Fe_2O_3	Silica Insoluble	Other constituents	
Katni, Jabalpur, C P (Lower Vindhyan)	Practically uniformable composition though variable in places but locally uniform	94 65	2 08	?	1 79	0 58	Extensively worked Thega limestone usually worked and used for burning
Multai (Itawa) (Upper Vindhyan)	Practically uniformable uniform locally in quality Strike Along	96 08	1 75	0 06	1 15	0 11	Usually worked in Bihar at Rhotas and near Sasaram Largely used for lime
Bara (Damoh dist) (Coal deposit)	Very large but interbedded with bands of Dolomite material variable Practically uniform for all chemical purposes	95 18	1 57	1 04	1 87	0 34	
Sylhet (Assam) (Karthar)	Very large but limited	95 4	1 91	1 72	0 58	0 40	
Chela (Khasi Hills) Panchet Hill	Ditto	98 6	0 35	0 3	0 45	..	Ferrous carbonate } Lime-bed
Manapathur	Ditto	45 05	11 53	0 23	19 28 (insol.)	3 6	Phosphoric acid
Dalli, Drug, C P Kandara, (Chanda, C P	Very large Unknown	63 49	11 41	(Fe$_2$O$_3$) 0 82	10 28 (insol.)	0 07	Ferrous carbonate } Lime-bed
		83 41	0 78	(Fe$_2$O$_3$)	16 18 (insol.)	4 15	Phosphoric acid
		8 15	2 0	0 0	1 16	0 12	Ferrous carbonate } Lime-bed
		94 56	96 8	4 0	2	0 08	Phosphoric acid
				1 2	to 2 5	0 02 trace of P	

Dolomitic Limestones —As seen in the table of Indian limestones the material from Panchet Hill is dolomitic in character The Cuddapah limestones of Gangpur are interbedded with bands of dolomitic materials It is from these beds that supplies of flux for Jamshedpur and Kulti are at present obtained—the former use dolomitic material, the latter use limestone From private enquiries it would appear that the Indian Iron works are quite prepared to accept good quality limestone or dolomitic material with as much as 6 per cent Silica if the price is reasonable A massive occurrence of dolomitic limestone occurs in the Maila river half a mile east of Sathbarua (Palamau) which may be worth investigation Other possible source of supply of dolomitic limestone, are in the Bâxa Duars (Bengal) and the Marble Rocks area (Jabalpur, C P) but those dolomitic marbles are not attractive because of the distance

Flourspar.—Although several small occurrences of fluorspar are known in India no workable deposits have been proved The Tata Iron and Steel Company endeavoured to exploit an occurrence of fluorspar at Barla in Kishengath State (Rajputana), but found that the quantity available was not attractive and the cost of working made the domestic material more expensive than imported fluorspar The imported quantities are said to average 400 tons annually, so that these supplies will have to be augmented in future if the Indian steel industry expands

4 Modifying Metals

Manganese —Manganese is added to steel in the form of alloys of iron known as *Spiegeleisen* (20 to 30 per cent Mn) made from low grade ores, and *Ferro-manganese* (70 to 80 per cent Mn) requiring high grade ores The average Indian production of manganese ore, 600,000 tons per annum is roughly half of the annual world's output It is estimated that 90 per cent of the world's output of manganese ore is consumed in the preparation of spiegeleisen and ' ferro ' for the steel industry Of the Indian production perhaps a twentieth part is at most utilized in the domestic steel industry From these remarks it would appear that the demands of the Indian steel makers for manganese ore could be met and almost forgotten by the producers of manganese ore in India

Silicon —There should be no difficulty in obtaining supplies of quartz for the preparation of ferro-silicon The quality of the raw material should have approximately the following composition silica 98 per cent , lime and magnesia each not to exceed 2 per cent , phosphorus and arsenic to be *nil* Iron oxide is not considered as an impurity The quartz rock now being used at Kumardhabi for making silica bricks is of this quality,

ANNEXURE

5 Refractory Materials

Chromite —Chromite or chromium ore is being worked in India in the vicinity of the Zhob and Pishen valleys in Baluchistan, in the Kadakola and other districts of Mysore State, and near Chaibassa in Singhbhum (Bihar and Orissa) The average run of chromite used for refractory purposes in the manufacture of chromite (or so-called chrome) bricks carries from 38 to 45 per cent of chromic oxide (Cr_2O_3) Much of the Indian material is of higher grade (over 52 per cent Cr_2O_3) So far as I know Chrome bricks are not now being made in India although the Tata Iron and Steel Company are said to have made some during past years No details are available showing the imports of chrome bricks but it is known that these bricks are used as a neutral lining in the basic steel furnaces at Jamshedpur There are no details regarding the reserves of chromite in India and practically all the production is being exported

Fire-clays —The ceramic works of Ranigani, Kumardhubi and Jabalpur are well known, but the deposits and beds of fire-clays throughout the country have not been investigated in a comprehensive manner It is therefore impossible to give any correct idea of the quantities and qualities of the various kinds of clays which constitute fire-clays The demand for Indian-made fire-clays in the iron and steel industry is small so that there has been no incentive towards exploitation It is known that very large quantities of good quality material are available but the preference for well-known brands of British fire-bricks persists to such an extent that on an average 3 million fire-bricks valued at Rs 9 lakhs are imported annually It is thus evident that there is scope for development and the Indian manufacturer appears to have a fair field for a satisfactory fire-brick

Gannister —The name truly applies to a silica refractory with a bonding material of fire-clay Similarly Dinas bricks refer to silica bricks with lime as a binder Both types therefore fall under the category of Silica discussed below

Magnesite —The Chalk Hills of the Salem district (Madras) contain the most valuable Indian deposits of magnesite There are other occurrences, *i e* , those of Mysore, Baluchistan, Rajputana and elsewhere which have also been worked Practically all the Indian production of magnesite over 19,000 tons (valued at Rs 2,40 000) in 1922 was exported The reserves of this material in the Salem district alone are considered as being almost unlimited The United States are said to consume over 200,000 tons of magnesite annually for refractory purposes It makes a basic lining in steel furnaces heating phosphoric pig iron.

Silica —The manufacture of excellent silica bricks is one of the features of the output of the Kumardhubi fire-clay and Silica works The raw material they use is a beautiful saccharoidal quartzite obtained from the Kharakpur Hills of Monghyr Material of a similar nature is reported to occur in Rajgir Hills near Gaya The numerous occurrences of clean quartz or quartzite of Naini near Allahabad and elsewhere which have been found suitable for the manufacture of glass are equally suitable for the preparation of the highest quality silica bricks Unfortunately this massive material has to be crushed and sieved but by so doing certain advantages are gained, the graded products are available for different purposes

The supplies of quartz, quartzite and quartz sands of good quality within reasonable distance of the Damuda coalfields are very large The specifications of quartzite suitable for the manufacture of silica bricks are upwards of 98 per cent silica, less than 2 per cent ferric oxide, and less than 0 5 per cent alkalies These requirements should easily be fulfilled by the materials available in almost every province in India, and in quantities so large that no fear need be entertained as to supplies for the future

From all that has been said with regard to the domestic resources of refractory materials it may be inferred that India is well supplied in these substances The reserves are enough to meet almost any conceivable domestic demand At the present time these materials are either being exported or are being developed on a negligible scale Much remains to be done to encourage the exploitation of these materials

ANNEXURE

INDIAN MINERAL PRODUCTION,

(In long tons (2,240 lbs.)

Year	Iron Ore	Coal	Manganese Ore	Wolfram	Chromite	Magnesite	Tin Ore(a)	Zinc Ore(b)
1911	96,100	12,716,614	670,290	1,308	3,801	3,400	97	—
1912	603,224	14,700,330	681,080	1,671	2,890	15,879	175	—
1913	370,815	16,208,000	815,017	1,688	5,678	14,086	171	—
1914	111,671	16,481,263	682,598	2,214	5,888	1,680	214	—
1915	1,000	17,109,092	160,416	2,157	3,707	2,150	289	—
1916	411,500	17,256,300	645,204	3,693	20,159	17,510	165	—
1917	11,456	18,212,018	590,811	1,542	27,061	18,202	66	—
1918	492,669	20,722,193	617,953	1,131	57,769	5,851	79	—
1919	508,750	22,628,097	592,905	4,525	46,449	17,126	1,569	..
1920	305,005	17,962,214	736,439	2,846	26,801	14,346	2,118(c)	750
1921	112,081	19,302,917	679,986	898	14,702	20,017	1,703	4,000
1922	6,475	19,010,088	674,101	943	22,777	19,273	1,875	18,061
1923	..	..	..	..	..	..	..	..

(a) Black Tin output not included

(b) Export quantities only

GOVERNMENT CENTRAL [illegible]

(c) Includes 1,228 tons of low grade ore